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SCIENTIFIC RESEARCH NEEDS

MINISTRY OF THE ENVIRONMENT

ONTARIO

October 1984

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PLANNING OF SCIENTIFIC RESEARCH

MINISTRY OF THE ENVIRONMENT

RESEARCH NEEDS

OCTOBER 1984

POLICY AND PLANNING BRANCH

RESEARCH COORDINATION OFFICE

HAZARDOUS CONTAMINANTS
AND STANDARDS BRANCH
135 ST. CLAIR AVENUE WEST
TORONTO, ONTARIO M4V 1P5

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This report presents a summary of 1985-86 scientific research needs of the Ontario Ministry of the Environment. The document has been prepared and updated to assist university researchers interested in submitting requests for financial grants in support of environmental research.

The updated list of research needs is classified into four research categories: Air Pollution, Water Pollution, Liquid and Solid Waste Research, and Analytical Methods and Equipment Development.

The following Appendix presents some information on the current projects including titles, objectives and description.

Some guidelines for the preparation of proposal and attachments are also presented herewith.

Applicants are advised that their proposal(s) will be evaluated, not only on scientific merits, but also on the adherence to Ministry research requirements and priorities. The latter is an essential part of MOE Research Planning Process which has been designed to:

- ensure that research is consistent with MOE goals;
- set up procedures for management and coordination of research activities;
- evaluate research performance; and
- ensure that research results are publicized and new technology is put to use.

It is hoped, with your cooperation, to complete the selection of successful proposals before the end of March 1985.

Information On Application For Grants:

Applications for funding of research proposals by grants should be submitted to the Research Coordination Office, Policy and Planning Branch, Ministry of the Environment. The original and three copies of the research proposal should accompany a completed form 02 including the required signatures of the Office of Research Administration of the University etc.

For further information, please direct your enquiries to:

Research Coordination Office
Policy and Planning Branch
Ontario Ministry of the Environment
135 St. Clair Avenue West
Toronto, Ontario
M4V 1P5
Tel: (416) 965-5788

2) Information on Application for grant:

Items Covered By a Research Grant:

Research Grants are intended primarily to cover operation expenses such as: employment of assistants, supplies, computer services, field trips, and equipment. It is assumed that the basic facilities required to carry out the proposed work are already available to the applicant. Capital equipment may be purchased with Grant funds although this type of approved expense should not exceed 50% of the total budget. This equipment remains the property of the Crown and must be returned to the Ministry unless arrangements are made to loan the equipment for a defined period of time.

Conditions For Academic Faculty and Staff

All research proposals, before submission to the Ministry, must be handled through University or College Research Administration Office which is held accountable for the grant funds.

In the event that any principal researcher specified in an approved project takes a sabbatical leave, leave of absence, or will otherwise not be present or active in the project, agreement should be made in writing with the Liaison Officer and the Research Coordination Office on the investigator's substitute, deferring, continuation, or termination of the project.

It is assumed that time of academics is a university property, and thereby they are not paid for their role in the project.

Application Format:

Applications for grants must be supported by detailed information showing:

a. A proposed title which briefly reflects the proposed activity;

b. A lucid statement of objectives;

c. A general description of the proposed study, its significance and relevance to environmental and health-related research, science or technology, or the protection of the total environment;

d. A concise statement of the work program, its start and completion date;

e. A succinct and clear statement of what will be achieved in each year of the proposal;

f. Statement of the benefits to MOE objectives and programs;

g. A detailed budgetary statement with cash flows shown for each year and normally based on the government fiscal year from April 1 to March 31st;

h. The names of principal and junior investigator(s);

i. A brief resume of the principal investigator(s) accompanied with a list and copies of recent publications;

j. Special capital equipment available to the researcher or to be acquired;

k. A signed acceptance on form or of the conditions of funding, including signatures of the principal investigator, the head of the research administration office etc.;

l. The original and three copies of signed application form and research proposals are required in submissions for funding by grants. In the case of contracts, the number of required copies is included in the terms of "Request For Proposal".

Salaries

The principal investigator(s) and other senior research staff associated with the project who normally receive a salary on a continuing basis from a university or college are not to receive salary payments, stipends, supplements or fees for services from these Grants.

Salary payments to post doctoral fellows, graduate students, technicians or other assistants should not exceed existing NSERC rates.

Alternate or Ancillary Funding:

Applicants must indicate whether funds for all or part of the submitted proposal or a similar project have been, or are going to be solicited or funded elsewhere. The following information should be presented:

- Names of other agencies;
- Amount sought from each agency; and
- Funds received to date from each agency.

Should any funds be approved by another agency during the submission or after approval of a project, grantees must inform the Ministry Liaison Officer in writing.

Joint funding of grant project by the Ministry with other government agencies is possible and is encouraged. it is in the interest of an applicant to suggest if other agencies will cooperate in joint funding and notify the Ministry if such arrangements appear possible.

The Ministry may take action to arrange partnership funding of a proposal if such a step is considered expedient.

Duration of Funding by Grants:

A proposal usually receives approval for the duration described in the submission form up to thirty six months from its approval. The awarding of a multi-year grant in any one year does not imply that funding will be certain in subsequent years at the end of each year. Grantees are required to annually establish their continued interest in the research and that it has been carried out satisfactorily

by a letter to the Research Coordination Office accompanied with copies of progress report(s), a list of purchased equipment, and a Financial Statement of Expenditure signed by their Research Administration.

Ministry decision for continuation of funding will be conveyed to the Director of Research Administration of the institution and the Principal Investigator.

3. Summary of Research Needs:

- Air Pollution;
- Water Pollution;
- Liquid & Solid Waste Research;
- Analytical Methods & Equipment Development.

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
1 Issue/ Subject	Hazard and risk due to airborne contaminants.	Lack of information on the biological response to contamination from industrial and municipal discharges.	Leachate collection, control and treatment technologies.	Broad spectrum screening Methods for contaminants in drinking, surface, and waste waters.
Type of Research Needed	- Studies (including short-term tests) of contaminant effects on receptors, humans, mammals, vegetation/soils, and/or biological systems. - Development of novel methods of collating and displaying hazardous contaminants information.	- in situ and ecosystem indicators of water quality impairment. - development of predictive toxicological-dose response relationship for populations/communities of aquatic organisms based on contaminant structure. - mutagenic and carcinogenic testing related to aquatic populations and human risk. - Application of predictive models to relate concentrations of priority pollutants in point sources (eg. sewage effluents) to their final concentrations in the receiving water and vise-versa.	- measurement of leakage by-passing tile system (field study). - efficiency of purge well. - leakage through earth liners. - assessment of leachate leakage from secure landfills. - definition of critical factors for leachate plume. - field testing of monitoring systems and materials with emphasis on complex organic chemicals. - methods for leachate control: infiltration, generation, cover, liner design, effectiveness and remedial measures. - Evaluation of treatment and disposal methods: physical, chemical, biological, recycling, etc.	Development of: - ICP - MS - GC - Microwave Plasma Emission Spectrometry - Ion specific mass detector and other broad-spectrum screening tools - Biological on-line monitoring

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
2 Issue/ Subject	Relationship between inhalable particulate and effects on human health.	Standard protocol for prediction of fate and removability of hazardous compounds in municipal Water Pollution Control Plants.	Destruction of municipal and indistrial wastes by incineration.	Determination of organic vapours in air samples.
Type of Research Needed	- Examination of effects of inhalable particulate on human health for application to standard setting, e.g. blood lead, respiratory function, etc.	Use of model compound-behaviours to determine fate and treatability of other compounds. What means can be effectively used to predict fate and treatability of waste water. Assessment of the fate, removability and stability of hazardous contaminants during and after sludge treatment.	- Improvements to state-of-the-art technology - Field and laboratory studies. - Technology for destruction and disposal of municipal and industrial wastes. - Characterization of incinerator ash, its leachability and utilization or disposal. - Effectiveness of existing incineration facilities. - Emission monitoring of hazardous contaminants.	Broad spectrum screening methods to extend the range of compounds currently monitored and to provide a more rapid and cost effective approach to analysis of organic air pollutants. Improved specificity, speed and cost of analytical methods.

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
3 Issue/ Subject	Improvement of routine, non-routine, and mobile monitoring techniques.	Removal capabilities of treatment techniques for specific trace contaminants in drinking water.	Indications of long-term degradation of solidified encapsulated fixed waste. Long-term impact on waste site is difficult to decide based on simple leachate extraction tests.	Development and validation of sampling protocols for contaminants in surface and drinking waters.
Type of Research Needed	- Further development of mobile monitoring analytical methods for an increased number of compounds and validate methods. - Rugged, simple, field monitoring technicques for a variety of organic and inorganic compounds. - Passive sampling techniques.	- Evaluate effectiveness of resin adsorption, reverse osmosis, aeration, and biological filtration as treatment processes for hazardous contaminant removal. - Protocol development for the assessment of treatment methodologies for groups of compounds and specific trace contaminants.	- Long-term integrity of solidified waste	- To determine significance of sampling protocols on analytical data. - Protocols should also consider microbiological parameters other than the standard coliforms etc. - Development/evaluation of samplers for collection of liquid samples (sewage effluent, drinking watr, etc) for purgeable organic analysis.

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
4 Issue/ Subject	Development of long-range and meso-scale atmospheric transport modelling to predict the impact of pollutants on receptors, and assess contributions of different sources to air pollution problems.	Insufficient data available on the persistence and migration and breakdown processes of select hazardous contaminants in soil and groundwater.	Landfill cover infiltration and effects on: - leachate production. - waste decomposition. - leakage of leachates from secure landfills. - mass transport through clay-type soil.	Investigation and development of laboratory techniques to assess leaching potential of specific wastes for hazardous waste classification.
Type of Research Needed	- Further model development	Laboratory and field tests of half-life and migration of various hazardous contaminants in the various soil and groundwater conditions found in Ontario, including the effects of complex mixtures that might be found in industrial waste disposal sites; eg. additive effects of several substances or increased mobility due to the presence of solvents.	- Field measurements using developed instruments. - Development and evaluation of landfill cover designs in terms of: i. material ii. thickness iii. shape iv. infiltration, etc.	- Serial leaching of specific wastes to determine the effect on contaminant concentration. - Development of a simplified procedure to determine the effect of long term (serial) leaching. - Review of parameters such as pH, time, oxygen, liquid to solids ratio, etc. to improve the ability of the procedure to approximate actual site conditions.

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
5 Issue/ Subject	Improvement of methods of risk assessment in connection with air pollution.	Paucity of epidemiological information relating pathogens and their effects on humans and other animals by ingestion and by other means (e.g. recreational).	Suitability of backfilling (inert) waste. Difficulties in allowing certain wastes to be used for construction purposes.	PAH analysis for air and air particulates.
Type of Research Needed	- Development of methodology for risk assessment due to air pollutant exposure.	a. Relationships between indicator organisms and human epidemiology. b. Resistance of specific pathogens to disinfection practices in drinking and waste water treatment plants. c. What represents an effective dose of major waterborne pathogens on humans? d. Impact of pathogens on aquatic and domestic animals. e. Define the significance/ effects of photo-reactivation of Indicator organisms and pathogens in surface waters which receive sewage effluent f. Disinfection by means of ultraviolet light plus either ozone or peroxide.	- Criteria for use in construction applications.	- Development of broad spectrum screening methods to extend the range of PAHs currently monitored with emphasis on specificity. - Development of cost-effective analytical methods for PAH's.

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
6 Issue/ Subject	Effects in Ontario of sulphur and nitrogen compounds and acids transported in the atmosphere.	The impacts of in-place pollutants in sediments on the aquatic ecosystem and human health.	Development of a method to assess methane flux in landfill. Development of guidelines for the management of gas migration.	Analysis of hazardous chemicals in complex industrial wastes.
Type of Research Needed	- Further work to increase our understanding of Atmospheric Chemistry and deposition, e.g. studies of chemical reactions in clouds, studies of ozone formation around industrial areas in Ontario, wet and dry deposition measurements.	1. Measurements of uptake by and release from sediments of trace substances. 2. Transformation of trace organics and inorganics in sediments. 3. Availability of trace organics and heavy metals in sediments to biota. 4. Measurement and modelling of sediment resuspension and redistribution due to wave action, storms and currents. 5. Development of criteria for evaluation and control of pollutants in sediments of receiving waters. 6. Contaminant breakdown processes in sediments, such as biodegradation. 7. Immobilization techniques such as chemical fixation, overlaying with clean segment.	Specific measurements of ventilation rates and flux.	Analytical methods must be developed for contaminants listed in Table 1 of the Interim Hazardous Waste Guideline and for the priority list prepared by the Hazardous Contaminants and Standards Branch.

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
7 Issue/ Subject	Assessment of human exposure to selected contaminants using data from fixed central monitoring stations.	Natural occurrence of some organic and inorganic contaminants (e.g. heavy metals, phenols, fluorides, radioactive materials) in surface and ground waters.	Impact on groundwater from chemical spills and spill clean-up technology.	Genotoxicity testing
Type of Research Needed	- More sensitive personal dosimeters need to be developed for a variety of contaminants. - To examine relationships between fixed central stations measurements and human health effects.	Determine sources and availability of trace metals, fluoride, radon, from specific geological formations, e.g. limestone, igneous rocks. Evaluate the significance of substances such as phenols produced by the decay of vegetation on aquatic life - (tainting, toxicity).	- State-of-the-art reviews - Case histories	- In-situ test systems needed to identify the presence of genotoxic compounds or conditions (mixture effects) in the environment. - Screening tests that can be quickly and economically carried out on environmental samples are required for laboratory application. - Relationships need to be developed between carcinogenicity and genotoxicity test response and human health effects.

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
8 Issue/ Subject	Insufficient information on the sources and fate of hazardous contaminants.	Information is needed on impact of suspended solids and sediment on stream use.	Accumulation of non-degradable contaminants on land (inorganics and organics)	Biological toxicity testing
Type of Research Needed	- Determination of hazardous contaminants sources, source strengths, sink mechanisms and strengths, atmospheric persistence and fate.	Case studies of streams to assess impacts of siltation on stream ecology, recreational potential and fishery resources. Potential for fine-grain sediments in removing trace contaminants from the water column (adsorption) and immobilizing these materials in the sediment.	- To establish criteria for defining acceptable levels. - To develop remedial (resoration) methods.	- Standardized on-site integrative biological tests to identify potential problem areas in air, soil and water. - Development of laborator protocols for recovery, identification, and enumeration of pathogeni organisms (virus, bacteria, protozoa) - Field methods for pre-concentration of viruses

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
9 Issue/ Subject	Improvement of current sampling methods for volatile metals and organometallics in ambient air.	Impact of organic compounds in pulp and paper discharges on aquatic life and fish consumption.	Environmental and health implications from burning of railway ties.	Surrogate parameters for water monitoring.
Type of Research Needed	- Sampling methodology needs development and validation.	- Developmental work required to identify and quantify compounds of significance, followed by assessment of effects on aquatic life. - Toxicity and uptake studies as well as depuration rate studies are required, relative to industrial and in-place pollutants. - Identification of tainting compounds. - Study of the toxicity of effluent from thermo-mechanical pulping and sulfide mill, for use in establishi ng criteria for mill effluents. - To develop technology for detoxification and treatment of effluents.	- To develop methods to qualify emissions.	Development and improvement of detection limits of surrogate parameters and correlation with specific and group toxic compounds in drinking and waste waters.

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
10 Issue/ Subject	Stack and emission sampling is extremely expensive.	Identification of Klebsiella pneumoniae and other micro-organisms in pulp and paper mill effluent and other carbo-hydrate rich effluents and their possible impact on human health.	Impact of land application of industrial sludges on the quality of surface and groundwaters and soils for use in the development of suitable guidelines.	Analytical standards.
Type of Research Needed	Development of: - More specific, low cost sampling and analysis protocols. - Continuous monitoring methods - Total reduced sulphur calibration method	To identify the various species of Klebsiella in pulp and paper effluents and to determine their impact on human health and livestock. To develop analytical procedures to isolate and directly measure Klebsiella pneumoniae.		Synthesis, quantification and validation of standard reference compounds such as dioxins, furans, PAH's as required for MOE laboratories and not available commercially.

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
11 Issue/ Subject	Real time monitoring of toxic airborne substances. Sufficient sensitivity for trace airborne contaminants.	Development of remedial measures to minimize the impact of agricultural practices on water quality.	Study of fate of hazardous contaminants in lanfill: - state of-the-art review. - field & lab studies. - contaminant half-life. - attenuation. - synergistic effects. - effect of disposal of industrial waste with municipal refuse on groundwater (physical and chemical interaction). - Impact of hazardous industrial wastes on landfills: migration, attenuation, etc.	Development of resin samplers for preconcentration of low levels of toxic contaminants in surface and drinking waters prior to analysis. - XAD and similar resin technology need to be extended and tested for a comprehensive range of trace organics. Rugged high flow field sampling systems need to be developed. - Evaluation of the capacity of resin system to recover total organic loading from waters and waste waters.
Type of Research Needed	- Dioxin and other compounds sampling techniques need development	Detailed evaluation of specific structural, tillage and cropping practices, i.e. environmental and cost-benefit studies including energy use. To document impact of vegetative buffer strips adjacent to streams and municipal drains on water quality. To develop optimum design and construction of cost-effective buffer strips. To investigate the effectiveness of livestock controls and agricultural waste management practices on receiving water quality with respect to bacteria, phosphorus, and sediment loads.		

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
12 Issue/ Subject	Correlation of monitoring data related to specific pollution sources.	The quantity and types of hazardous contaminants leached from plastic pipes and other compounds, coating etc., in contact is not well defined.	Studies on toxic hazardous waste schedule: - Assessment of existing hazardous waste schedule. - Development of criteria for listing of hazardous waste based on toxicological studies (chronic and acute toxicity, persistence, bioaccumulation, leachability, etc.)	Non-separative analytical methods for air analysis.
Type of Research Needed	- Application of receptor modelling techniques to some specific situations in Ontario to evaluate this methodology. - Development of methods to characterize emission sources in a way useful for receptor modelling.	To investigate potential trace contaminant leachates from piping, coatings and other material in contact with potable water. Inventory of materials, used in Ontario, in contact with drinking water e.g. piping, liners, paints, chemical additives and an assessment of the potential magnitude of contamination.		Rapid, specific, non-separative analytical methods need development. Tiered analytical systems of increasing resolution and sensitivity need further work.

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
13 Issue/ Subject	Deposition and accumulation of airborne compounds.	The impact of agricultural tile drainage on receiving watercourses.		Tiered testing of groundwater for landfill investigations.
Type of Research Needed	- Deposition monitoring technology needs further development - Pathways of contaminants to fruits and vegetables via soil or air should be studied with respect to mercury, lead, boron, nickel, etc.	- To evaluate nutrients and solids transport under varying cropping and tillage conditions. - Study of the effects of tile drainage and open ditches on peak flows and dry weather flows.		- Development of a tiered testing protocol for groundwater contaminant analysis.

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
14 Issue/ Subject	Uncertainty in calculating toxic compound concentrations downwind of emergency sites.	Sediments dredged from highly contaminated areas create the potential for environmental damage at both the point of dredging and disposal.	Accumulation of non-degradable organic and inorganic contaminants on land.	On-site sampling of gaseous emissions.
Type of Research Needed	- Comparison and validation of different models. - Effect of local topography on dispersion.	- Develop biological procedures to characterize materials to be dredged in order to select appropriate disposal procedures. - Evaluate dredging techniques and compare their effectiveness in terms of disruption of the surrounding aquatic environment.	- Studies leading to development of criteria for acceptable levels.	Further development of air sampling methods for both on and off-site measurements. Development of simple, rugged field analytical methods for landfill air contaminants emissions.

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
15 Issue/ Subject	Formation, decay and reaction mechanisms of many primary and secondary pollutants.			
Type of Research Needed	- Study of intermediates in pollutant reactions; modelling of Atmospheric Chemistry including hazardous contaminants.			

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
16 Issue/ Subject	Relationship between indoor and outdoor air contaminants.		Evaluation of leachate treatment processes including marsh treatment designed for: i. landfill leachates ii. sawdust leachates, etc.	
Type of Research Needed	- Indoor air concentrations of different pollutants need to be assessed together with their relationship to outdoor measurements and the implications for abatement action based on outdoor measurements of selected contaminants.			

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
17 Issue/ Subject	Effects of accumulation of various pollutants, e.g. on vegetation, short or long-term.			
Type of Research Needed	- Establishment of dose response data for the effect of pollutants, e.g. ethylene, arsenic, nickel, SO_2, O_3, fluorides on different species. - Determination of long-term health effects.			

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
18 Issue/ Subject	Uncontrolled or inefficient processes may produce unwanted air emissions.			
Type of Research Needed	- Determination of most efficient generic processes for selected industries or plants, e.g. pulp and paper, some municipal incinerators.			

	AIR POLLUTION	WATER POLLUTION	LIQUID AND SOLID WASTE	ANALYTICAL METHODS
19 Issue/ Subject	Dispersion from non-standard sources (e.g. mine tailings, fugitive emissions).			
Type of Research Needed	- Dispersion modelling for non-standard sources needs further development.			

New Additions to Research Needs Document

1) Issue - Characterization of the hazardous contaminants in combined sewage overflows (CSO's) and stormwater runoffs (SWR's) and development of optimal control options.

The Type of research needed:

- refine the relationship between land-use patterns, i.e., percent industrial, residential and commercial uses and the type and concentrations of hazardous contaminants in CSO's and SWR's;

- distribution of hazardous contaminants between solids and liquid phases in CSO's and SWR's;

- relationship between concentrations of hazardous contaminants in CSO's to rate and duration of overflows (i.e. the hydrographs). This would define the optimum volume of holding tanks for controlling hazardous contaminants in CSO's and SWR's;

- the rate of accumulation and identification of hazardous contaminants accumulated on urban land surfaces;

- the removability of selected hazardous contaminants in CSO's and SWR's by conventional means, e.g. solids removal and/or street sweeping;

- innovative techniques and mechanisms to effectively monitor and control hazardous contaminant discharges into sewer systems.

2) Issue - Innovative sewage treatment process research

Type of research needed:

Assessment of the Segmented Batch Reactor, Biological Phosphorus Removal and integrated sewage treatment and energy production plants.

3) Issue - Prediction of currents from wind data at locations where no current meters have been operated. Such predictions are often necessary for locations of small outfalls or spills.

Type of research needed:

Designing a model using wind and current data from the Great Lakes nearshore areas in order to predict current directions and speed for dispersion studies without the need for actual current measurements.

4) Issue - Development of a numerical/mathematical model to predict the extent and water quality of a river plume where it merges in the lake and loses its identity.

Type of research needed:

A model should be designed and tested to handle one or more rivers without or with some point sources under different climatological conditions.

5) Issue - Defining the fate and transport of bacteria, organic and inorganic compounds in the nearshore Great Lakes environment by incorporating the effects of physical processes of wind, temperature and nearshore currents.

Type of research needed:

The development of computer simulations and modelling techniques in the nearshore Great Lakes by studying the dispersion patterns of near-field and far-field discharges (industrial and municipal outfalls).

6) Issue - Fate and pathways of in-stream pollutants associated with solids.

Type of research needed:

1. Investigate relationship between suspended sediment and metals and factors that influence it.
2. Investigate contribution of sediment entrainment in rivers to bacterial levels.

7) Issue - Agricultural nutrient sources, transport

Type of research needed:

1. Investigate relationship between sediment erosion and phosphorus yields - overland delivery mechanisms.
2. Study phosphorus transport, retention and transformation processes in a Great Lakes tributary (biogeochemical cycling), and evaluate erosion and sediment control implications.
3. Provide cost-benefit analysis of diffuse source controls in Ontario.
4. Investigate the Holland River as affected by diversion of a major municipal point pollution source.

8) Issue - Economics of conventional road de-icing and alternatives.

Type of research needed:

Provide a comprehensive cost-benefit analysis to establish economy of salt usage (an alternatives to salt) in relation to damage to structures and environment.

9) Issue - Development of risk and reliability methods for evaluating wastewater assimilation.

Type of research needed:

- performance analysis of reservoir operation in lowflow augmentation.
- Bayesian risk decision in quantity and quality design criteria.
- reliability and trends in loadings in Ontario tributaries.

10) Development of regional water quality screening methods (indices/models) to identify potential water quality problems.

Type of research needed:

- industrial effluents and flow correlation for specified trace contaminants.

11) Quantifying uncertainty in nutrient/contaminant loadings in-stream and its projected impact on the Great Lakes.

Type of research needed:

- stochastic analysis of ambient water quality data.
- impact and uncertainty in long-term phosphorus loadings to Great Lakes.
- model development/implementation to investigate remedial measures scenarios.

12) Contaminant model development for mine tailing discharge assimilation and acid rain study.

Type of research needed:

- model implementation in Serpent River for various management scenarios.
- model implementation for investigating fate of acid rain in the Dorset-Haliburton Region.

13) Detection of pesticide residues in tributaries and their impact on the inland water system.

Type of research needed:

- frequency and trends in detections in selected tributaries (Grand/Saugeen/Thames).
- method to evaluate cause and effect relationship.
- screening model to evaluate likely management scenarios.

ISSUE 14: DRINKING WATER QUALITY OBJECTIVES AND TREATMENT PROCESSES

Type of Research Needed:

- Provision of information required for the development of drinking water quality objectives for MOE list of priority chemicals.
- Use of mutagenicity testing in assessing drinking water treatment processes - effectiveness/efficiency of treatment.
- To develop means of predicting/establishing short-term variations in water quality at intakes and establishing subsequent treatment technology.

ISSUE 15: CASE STUDIES OF THE EFFICIENCIES OF SELECTED CONVENTIONAL AND ADVANCED WASTEWATER TREATMENT SYSTEMS CURRENTLY USED IN THE ONTARIO PULP AND PAPER, STEEL AND PETROLEUM/PETROCHEMICAL INDUSTRY IN REMOVING HAZARDOUS CONTAMINANTS

Type of Research Needed:

- Identification and low-level quantification of selected contaminants of concern (e.g. PAH's - steel industry; resin and fatty acids - pulp and paper; chlorinated aromatics - petrochemical) in the influent and effluent streams of a variety of treatment systems (e.g. Biox, carbon filtration, aerated stabilization).
- Comparison of removal efficiencies of different systems and identification of major design and operating factors influencing removal.
- Evaluation of toxicity to fish and taste and odour/tainting potential of influent and effluent streams and identification of probable associations/correlations of these effects with the contaminants (and their levels) found.

NEW ADDITIONS TO RESEARCH NEEDS DOCUMENT
(LIQUID AND SOLID WASTE RESEARCH)

1. ISSUE - Lack of information on proper disposal of off-specification and expired waste pharmaceutical products.

Type of Research Needed:

° review existing waste types and volumes, disposal methods, and their potential environmental impacts.

° recommend appropriate disposal options of the various classes of pharmaceuticals (antibiotics, antineoplastics, steroids, etc.) and their MOE waste classification (i.e. hazardous or non-hazardous).

2. ISSUE - Research is required into the effects of on-going serial leaching of wastes in landfills. Current leachate tests only determine the concentration of contaminants that are initially released.

Type of Research Needed

° determine if the concentrations stabilize, increase, or decrease with time.

° evaluate a wide range of wastes and determine if the changes are significant and whether test methodologies should be developed for inclusion in MOE's regulatory program.

3. ISSUE - Research is required to inventory existing solidification technologies and the methods used in their evaluation.

Type of Research Needed

° identify criteria used by other jurisdictions to determine when a solidified hazardous waste can be considered non-hazardous, whether solidified wastes continue to retain contaminants in the long term, and the impact of freeze/thaw and wet/dry cycles on the wastes.

4. ISSUE - Under the interim hazardous waste definition, small quantity wastes (less than 5 kg./mos.) are exempted and can be disposed of at approved sanitary landfills.

New Additions to Research Need Document
Page 2

Type of Research

- carry out a review to determine how small quantity wastes from laboratories and commercial establishments are being managed and the potential environmental impacts.

- determine whether small quantity exemption should be further reduced or even whether it should be increased.

APPENDIX

Information on Current Ministry Research Projects (1984/85)

PROJECT TITLE: 55 PL CHEMICAL IDENTIFICATION AND BIOLOGICAL ASSAY STUDIES OF ENVIRONMENTAL MUTAGENS, PROMOTERS AND INHIBITORS	IN-HOUSE
	EXTERNAL
	GRANT
	CONTRACT
	UNSOLICITED

(1) OBJECTIVE/S: (See previous Form 02)

1. To utilize newly developed bio-assay systems to determine the mutagenic activity and carcinogenic potential of toxic environmental pollutants.
2. To separate and identify quantitatively the PAH and other potentially mutagenic and carcinogenic organic compounds from the polluted water environment.
3. To determine which chemicals or combinations of chemicals are responsible for mutagenic activity.
4. To determine which substances can act as promoters and which substances can act as inhibitors of mutagenic or carcinogenic chemicals.
5. To investigate the effect of mutagenic chemicals on plants grown in greenhouses and on fish living in fish tanks.

(2) DESCRIPTION: (See previous Form 02)

It is planned to utilize newly developed, rapid, accurate and economical *in vivo* bio-assay systems to determine the mutagenic and carcinogenic potential of various combinations of chemicals found in the air and water environments. It is also planned to investigate substances that act as promoters and other chemicals that can effectively inhibit the mutagenic potency of various chemical mixtures. Mice and fish will be used as test animals. The tier testing strategy will include a spectrum of genetic toxicity tests including bacterial mutagenicity, *in vivo* and/or *in vitro* sister chromated exchange, *in vivo* chromosomal aberrations (micronuclei) and *in vivo* sperm head abnormalities.

TITLE: "FIELD MEASUREMENT OF INFILTRATION THROUGH LANDFILL COVERS." #58 PL

OBJECTIVES: The objective of this study is to determine, by using literature searches, the potential genotoxic hazards, if any, of specific environmental contaminants, from both anthropogenic and indigenous sources.

DESCRIPTION: Literature searches are to be requested from the Rand Corporation and the Environmental Mutagen Information Centre (EMIC) on the available mutagenic, carcinogenic and teratogenic test data for the following potential sources of environmental contaminants.

1. Sewage effluents
2. Leachates from land fill sites
3. Effluents from specific major industries such as chemical industries and foundries.
4. Raw and finished drinking water.

An individual will be hired to collate the information, organize it for easy reference and prepare detailed summary reports on each subject.

TITLE: INVESTIGATIONS OF NITRATE DISTRIBUTIONS AND NITROGEN TRANSFORMATIONS IN A SHALLOW SANDY AQUIFER NEAR ALLISTON, ONTARIO." #62 PL

OBJECTIVES: (1) Characterise the nitrate distribution in the shallow sand aquifer near Alliston, Ontario. (2) Determine if current conditions are likely to worsen with time. (3) Develop alternate groundwater development methods that would alleviate the existing contamination problem in domestic wells. (4) Evaluate the factors controlling the occurrence of denitrification in the aquifer. (5) Evaluate the applicability of the results to other shallow, unconfined aquifers in agricultural areas in Ontario.

DESCRIPTION:

A recent survey by Dr. A.K. Hill of York University has shown extensive nitrate contamination of domestic wells located in a shallow sandy aquifer near Alliston, Ontario. Based on previous studies conducted at the University of Waterloo, it is probable that as a result of denitrification, the zone of contamination extends for a relatively shallow depth below the water table. Field studies will be conducted to evaluate the extent of the contaminated zone, to develop alternate groundwater development procedures and to determine the hydrogeochemical controls on the denitrification process.

PROJECT TITLE: "DESIGN OF GROUNDWATER MONITORING PROGRAMS FOR WASTE LANDFILL SITES." #63 PL

OBJECTIVES: Evaluation of the applicability of statistical methods, simulation techniques and models in the field of environmental monitoring of ground water quality at various landfill sites.

DESCRIPTION: To assess the suitability of statistical methods and models through a literature review, analysis of data available to the Ministry of the Environment from two monitored landfill sites and by simulation techniques, and to apply the statistical method found most suitable to the design of ground water monitoring quality methods.

PROJECT TITLE: "THE DEVELOPMENT OF A FRESHWATER FISH TEST TO IDENTIFY AQUATIC TOXIC CONTAMINANTS." #64 PL

OBJECTIVES: The primary objective of the proposed study will be to develop a testing protocol applicable to the testing of potentially genotoxic inputs and compounds to assess whether or not they constitute an environmental hazard to fish. The use of fast growing tropical fish embryo and larval stages and the measurements of a direct genotoxic effect on these sensitive life stages will be used to assess the genotoxic hazard, and provide a correlation between lethal levels, genotoxic levels, and levels hazardous to fish health.

DESCRIPTION: Tropical fish embryos will be exposed immediately after fertilization to a reference (positive) genotoxic agent, Ethyl Methanesulfonate. The high mitotic activity of these stages makes them sensitive to the effects of this genotoxic compound. Samples from a series of graded doses will be taken to determine the time course of any effect during the first twenty-four hours of life. Survival, hatchability and teratogenicity will be measured over the same dose range as the embryo's mitotic index, as will the numbers of micronuclei in yolk sac cells and both embryo and yolk sac cell anaphase-telophase aberrations.

TITLE: "MONITORING GENOTOXICITY IN THE ATMOSPHERE USING SISTER CHROMATID EXCHANGES IN MICE." #66 RR

OBJECTIVES: To develop and evaluate a procedure which will permit a straightfor and ungoing monitoring of the environment for agents genotoxic to a mammalian system. The specific procedure involved is Sister Chromatid Exchange (SCE) analysis.

DESCRIPTION: The basic approach involves comparing SCE levels in mice which hav been exposed to the atmosphere (environment) in the area being tested with SCE lev in control mice. The procedures entail treating the mice with a series of doses 5-bromodeoxyuridine and 5-flurodeoxyuridine then giving them a single dose of colchicine and sacrificing the animals. The bone marrow of the femur is collected treated, fixed to a slide and stained with a Giemsa mixture.

Both laboratory mice and wild mice will be used in this study. In some cases the animals would have been exposed to known agents while in others the exposure to genotoxic agents would occur under natural conditions.

TITLE: "REVISED MONITORING SCHEME FOR PERSISTENT AND TOXIC ORGANICS IN GREAT LAKES SPORTS FISH." #67 RR

OBJECTIVES: To re-assess the current status of persistent residues in Great Lakes ports fish; to develop and implement new monitoring methodology; to accumulate an adequate data base on the current/future contaminant "cocktail" and to provide information to help characterize the total contaminant profile in Great Lakes fish.

DESCRIPTION: An extensive literature search will establish the classes of compounds requiring inclusion in an up-dated monitoring scheme. The LSB will also produce persistent pollutant profiles for fish from each Great Lake by applying current diagnostic techniques (GC/MS, ICAP-ES, etc) to a native, broad-ranging indicator species. Data from both the literatu review and the diagnostic work will be evaluated to establish a new priority contaminant list for future monitoring programmes. Current methodology will be modified or new techniques will devised and a new tunable element-specific detector will be developed for establishment of a mprehensive pollutant profile, and an extensive data base.

TITLE: "EXPERIMENTAL MODELLING STUDIES OF HAZARDOUS SUBSTANCES IN ONTARIO." #68 RR

OBJECTIVES: The objectives are to develop at the University of Toronto a group which will work closely with the Ministry to provide (i) relevant data on physical chemical properties of toxic substances through literature review and laboratory measurement; (ii) to develop novel modelling procedures to assess the environmental behaviour of these substances in Ontario.

DESCRIPTION: We will select, with Ministry assistance, a number of toxicologically important contaminants which are present in Ontario in known quantities and locations, and for which some monitoring data are available.

The following compounds are initially suggested:

(i) a low molecular weight halocarbon such as a chlorinated ethane or ethylene (principally an air pollutant);
(ii) a phenol such as p-cresol (principally a water column pollutant);
(iii) a highly hydrophobic organic compound such as a PCB group (principally a sediment contaminant);
(iv) a pesticide or soil pollutant;
(v) compounds of general distribution, eg naphthalene, chloronaphthalenes, benzene, chlorobenzenes.

A literature survey will be undertaken to gather data and physical chemical measurements will be made. An extended fugacity model will be developed to integrate these properties into "behaviour profiles".

TITLE: A MASS SPECTROMETRIC STUDY OF SELECTED AIR POLLUTANTS." #69 RR

OBJECTIVES:

1. To investigate the reaction mechanisms and specific rate constants of selected air pollutants employing the quadrupole ion store/mass filter system (QUISTOR/QUAD).
2. To determine, in consultation with the monitor, the priorities of the Atmospheric Environment Service with respect to the following types of reaction: (i) Thermolysis of polyaromatics, (ii) chlorinated phenol with O_2 from ambient air, (iii) ion chemistry of selected amines, and (iv) reactions of organic fluorides.
3. To study the enhanced reactivity of selected pollutants excited vibrationally with an infrared laser beam.

DESCRIPTION:

The quadrupole ion store (QUISTOR) confines ions in a small volume where they undergo reactions with surrounding neutrals. The reacting mixture is then mass analysed after different lengths of storage times. The QUISTOR/QUAD sample inlet system is fitted with a quartz thermolysis tube, heated sample chamber and a gas inlet bulb controlled by a needle valve. Gases from the inlet bulb flow past the sample chamber and mix with the sample at temperatures up to $\sim 700^{\circ}C$ thus recreating environmental conditions in smokestacks and diesel engines. The ions stored in the QUISTOR may also be excited by an IR laser beam.

PROJECT TITLE: #70 RR

"Index selection for ozone insensitive beans."

IN-HOUSE	
EXTERNAL	X
GRANT	X
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UNSOLICITED	

OBJECTIVE/S:

-A protocol for improving ozone insensitivity and a selection index for field beans will be developed.

-To develop a method for measurement of ozone damage using digitized video images of bean plants.

DESCRIPTION:

Simultaneous selection for mutiple characteristics is efficiently performed by developing a selection index for field beans relating to ozone injury. This index will ease the identification of germplasm with optimum combinations of ozone insensitivity and other agronomically essential characteristics.

The results of the study will be directly implemented through the development and release to growers of improved white bean cultivars.

PROJECT TITLE: #72 RR

"DOSE-RESPONSE RELATIONSHIP OF O_3 AND YIELD IN POTATO AND PEANUT CROPS."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

1. To determine yield losses in sensitive peanut and potato cultivars from ozone using the antioxidant EDU.
2. To develop dose-response relationships of ozone effect on yield in peanuts and potato.
3. To develop an ozone injury cost value to the peanut and potato industry.

DESCRIPTION:

Field studies for potato at Simcoe and Cambridge and peanuts at Delhi would compare crops grown and protected for ozone with unprotected crops. Results will be used to predict crop loss from ozone based on ozone records of the past several years. In addition, past year's information will be used to develop a dose response relationship to ozone.

TITLE: "SWEET CORN, CABBAGE, CAULIFLOWER AND RUTABAGA RESPONSES TO AIR POLLUTION IN SOUTHERN ONTARIO." #73 RR

OBJECTIVES:

1. To evaluate sweet corn, cabbage, cauliflower and rutabaga responses to air pollution.
2. To correlate ozone injury and yield reductions with monitoring data.
3. To evaluate cultivar sensitivity.
4. To evaluate chemical protectants against ozone.
5. To evaluate location effects and interactions.

DESCRIPTION:

Field experiments are to be conducted at Simcoe, Harrow and Cambridge Research Stations using six cultivars each of sweet corn and two each of cabbage, cauliflower and rutabaga and weekly applications of chemical antiozonants. Controlled exposure experiments are to be conducted at Guelph to obtain additional information on protection and sensitivity of cabbage.

TITLE: "EVALUATION OF CONTAMINATED WATER AND SOIL SITES AS SOURCES OF AIRBORNE HAZARDOUS MATERIALS." #74 RR

OBJECTIVES

The objective of this proposal is to obtain funding for the second year of a three year project in which the aim is unchanged and is to develop equations for predicting the rate of volatilization (and hence the source strength to the atmosphere) of organic pollutants which are present in dispersed source form in water bodies or in soils. This requires (i) prediction of chemical potential or fugacity from concentration, ie, the "driving force" for diffusion (ii) development of kinetic equations with kinetic parameters (diffusivities and mass transfer coefficients and (iii) combination of (i) and (ii) to yield source strength or mass flux into the atmosphere. Such sources can then be juxtaposed with emissions from other sources and background levels to determine how the non-point source contributes to the overall level of airborne hazardous material exposure.

DESCRIPTION

To accomplish this objective we are undertaking two separate but complementary experimental programs:

(i) Measurement of relevant equilibrium (fugacity capacity) physical chemical properties of selected organic compounds namely vapour pressure, aqueous solubility, air-water partition coefficient (Henry's Constant) soil sorption partition coefficient and its "surrogate" the octanol water partition coefficient (the methods used will be the latest techniques as recommended by OECD, USEPA or NBS). This work is underway by Mrs. G.L. Huang as her M.A.Sc. research project. She has measured the aqueous solubility and octanol-water partition coefficients of a series of polynuclear aromatic hydrocarbons and polychlorinated biphenyls. This is very demanding work as the solubilities are very low and contamination is a severe problem. As part of this work we have gathered and analysed PCB data and published it as a chapter in a text "PCBs in the Great Lakes" (Ann Arbor 1982). Work is also underway on Henry's Law constant determination.

(ii) Two small scale experimental systems have been set up and operated, one with air over water and one with air over soil in which volatilization rates have been measured from some 6 litres of water or soil under conditions of temperature and air turbulence similar to those existing naturally. Miss A.Hughes is operating the water evaporation system as her M.A.Sc. project and has successfully generated results for a series of volatilizing solutes. This series was selected to cover the relevant range of air-water partition coefficients encountered in the environment. The soil system is at a more exploratory stage, the work being done by Mr. Skenderis.

In general, we believe that the work is proceeding well and according to plan.

TITLE: "PROVISION OF PAH'S AND AZA PAH'S AS ENVIRONMENTAL STANDARDS." #75 RR

OBJECTIVES:

1. To synthesize by short and efficient routes a number of PAH's which have been identified as atmospheric contaminants. The synthetic targets (see Table 1, detailed proposal) are selected on the basis of lack of availability and high carcinogenicity.
2. To prepare similarly a number of aza-PAH's (also known carcinogenic air pollutants, whose environmental fate and persistence is largely unknown.
3. To prepare a literature review, to date unavailable, on the current state of knowledge of aza-PAH's.

DESCRIPTION:

The synthetic work is largely based on recent methodology developed in our laboratory which allows the efficient preparation of 100 mg quantities of a number of PAH's in short order. This methodology (directed metalation) is being applied to the synthesis of two aza-PAH's. Different strategies will be used for the synthesis of two more complex PAH's. Analytical purity will be established by hplc and gc/ms techniques.

TITLE: "THE CHEMORECEPTIVE MEMBRANE AS AN ELECTROCHEMICAL SENSOR FOR TRACE ORGANIC SPECIES IN THE ATMOSPHERE." #76 RR

OBJECTIVES: The analytical potential of the electroanlytical signal generated at the surface of lipid membranes on chemoreception has been demonstrated. Through previous Air Resources funding a selective NH_3 sensor has been developed. It is the purpose of this project to develop supported membrane systems on device structures by Langmuir technology for selective chemical sensing in the gas-phase.

DESCRIPTION: This project will be concerned with a study of deposition and protection of lipid films on support and device structures. Langmuir film technology will be used in conjunction photopolymerization of lipid layers. The films will be characterized by surface methods and compared with free lipid membranes with respect to electrochemical stimulation. Electronic devices for sensor production will be provided by collaborating groups.

TITLE: "SAMPLING AND ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBON DERIVATIVES IN URBAN AIR PARTICULATES." #78 RR

OBJECTIVES: 1. Development of analytical methodology for polycyclic aromatic hydrocarbon (PAH) derivatives, particularly nitro- and oxy-PAHs, in urban air particulates.
2. Examination of the formation of these derivatives as artifacts in various sampling methods.

DESCRIPTION: The chemical composition of urban air particulates is very complex, consisting of hundreds of organic and inorganic components. It has been shown that much of the mutagenic activity observed in these samples is associated with compound classes other than the well-studied PAHs. Methods for the analysis of these compounds, mostly nitro- and oxy-PAH derivatives, are not well established and, in addition, it has been shown that they may be formed as artifacts of sampling.

TITLE: "DEVELOPMENT OF A TUNABLE LASER-BASED HYDROGEN PEROXIDE MONITOR." #79 RR

OBJECTIVES: To continue the development of a Tunable Diode Laser Absorption Spectrometer (TDLAS) to measure the concentration of Hydrogen Peroxide in air. To improve the sensitivity of the TDLAS and to look at the feasibility of measuring ammonia(NH_3) and formaldehyde (CH_2O) with the same technique.

TITLE: "CHEMICAL SPECIATION OF AIRBORNE PARTICULATE MATTER." #80 RR

OBJECTIVES:

The objective of this research is the development of methods for the determination of the chemical state of a wide variety of elements present in airborne particulate materials through separation by volatilization and determination by neutron activation analysis.

DESCRIPTION:

A method for chemical speciation of airborne particulates by selective volatilization with organic vapours and determination by neutron activation analysis will be studied. A technique for calculation of optimum analytical conditions for these determinations by neutron activation analysis will also be developed and applied. This procedure will employ advance prediction of gamma-ray spectra , spectrum analysis and simplex optimization.

TITLE: "SYNTHESIS OF POLYNUCLEAR AROMATIC HYDROCARBONS OF INTEREST IN ENVIRONMENTAL POLLUTION." #81 RR

OBJECTIVES:

To prepare specific cyclopenteno-annelated polynuclear aromatic hydrocarbons related to cyclopenta(c,d)pyrene of interest in environmental chemistry. These samples are to be used as standards for characterization purposes.

DESCRIPTION: A method for preparing specific alkylated PNH's has been developed in our laboratories. This method permits the incorporation of cyclopentene and dihydrofuran ring systems in these derivatives, many of which are related to common environmental hydrocarbon contaminants. Analogues of cyclopenta(c,d)pyrene, benzo(a)pyrene are going to be prepared for characterization of possible hydrocarbon contaminants of unknown structures.

TITLE: "LASER INDUCED EMISSION SPECTROSCOPY OF POLYCYCLIC AROMATIC HYDROCARBONS IN LOW TEMPERATURE MATRICES." #82 RR

OBJECTIVES:

To develop a laboratory capability to obtain laser excited fluorescence spectra of PAH's in low temperature matrices.

DESCRIPTION:

It is intended to use a pulsed tunable dye laser to excite the fluorescence of trace quantities of PAH's in alkane matrices at 10-20 K in order to make quantitative analyses of complex mixtures obtained in environmental sampling programmes.

TITLE: "METHODS FOR SAMPLING AND ANALYSIS OF ASBESTOS AIR POLLUTION IN ONTARIO." #83 RR

OBJECTIVES:

1. To obtain by Electron Microscopy (E.M.) a baseline data of asbestos levels present in outdoor air of Ontario.
2. To correlate asbestos exposure levels obtained by E.M. techniques to those obtained by the traditional occupational method (ie. optical microscopy).
3. To evaluate various air sampling methods and E.M. evaluation techniques and to determine an optimal or alternate method.
4. To identify types of asbestos and characterize fibers by their length and diameter distribution in air samples as well as in biological materials
5. To develop indepth expertise in asbestos evaluation at McMaster.

DESCRIPTION:

1. By collection of air samples of outdoor air and analysis by E.M.
2. Collection and analysis of occupational samples followed by data analysis using standard regression technique
3. By reviewing, comparing and analyzing samples using the published procedures
4. Analysis by Electron and Optical Microscopy
5. By developing various air sampling methods and analytical techniques

PROJECT TITLE: #84 RR

"Collaborative Study on Short-Term Tests for Genotoxicity and Carcinogenicity"

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To augment the current World Health Organization international carcinogenicity/mutagenicity study and data bases by providing sperm abnormality assay test results on ICR-Swiss mice treated by gavage.

DESCRIPTION:

WHO chemicals will be administered via gavage needles into the stomach of ICR-Swiss mice for 5 consecutive days. Five weeks later spermatozoa from each animal will be analyzed for abnormalities.

TITLE: "EVALUATION AND APPLICATION OF PNMR IN THE ANALYSIS OF ENVIRONMENTAL SAMPLES." #85 RR

OBJECTIVES: 1. To assess the application of the pulsed nuclear magnetic resonance technique to the quantitative analysis of environmental samples.

2. To develop the methodology for the quantitative analysis of environmental samples using the pulse technique.

3. To explore the application of the pulse hour technique to the characterization of hazardous wastes.

DESCRIPTION:

A sample, having compounds bearing hydrogen atoms, placed into a magnetic field and subjected to a short pulse of radio frequency, generates a residual magnetization which decays with time. This residual magnetization, measured after a pre-determined time delay, can be related to the concentration of various components. The sample work-up is minimal and the time of analysis is short. Signal averaging allows analysis of solutions with low analyte concentration.

TITLE: "A BIOLOGICAL MODEL FOR PARTIONING OF MERCURY, LEAD AND CADMIUM IN AQUATIC SYSTEMS." #87 RR

OBJECTIVES:

1. To determine for lead, cadmium and mercury the concentration factors (CF) from water into selected biota, at ambient levels below toxic thresholds, in experimental microcosms.
2. To determine how pH affects 1.
3. To determine if CFs change when organisms are cultured singly or in a simple model food chain.

DESCRIPTION:

1. Cultures of single populations, under controlled conditions, exposed to low concentrations of the metals (the levels determined from those measured in the field in acid stressed lakes) to determine CFs.
2. Microcosms with simple food chains will be used as follow up from the single population experiments and rates of uptake will be determined.
3. For selected sets of conditions, the pH of the water will be controlled to determine its influence (over range 4 - 7) on metal uptake.

PROJECT TITLE: "EPIDEMIOLOGICAL STUDY OF DISEASE INCIDENCE AND RECREATIONAL WATER QUALITY AT SELECTED CONSERVATION AREAS IN SOUTHERN ONTARIO." #89 PL

OBJECTIVES:

1) To develop techniques for the isolation, enumeration, and identification of viruses, Campylobacter jejuni, Legionella and Giardia from the environment.
2) To utilize a prospective cohort epidemiological study to determine bather illness at conservation area beaches.
3) To determine the relationships among bacterial indicator organisms and pathogens as well as viruses in the water at the selected sites and the corresponding bather illnesses.
4) To establish accessible procedures for the computer analyses of the combined microbiological and epidemiological survey data.

DESCRIPTION: Metropolitan Toronto and Region Conservation Authority beaches will be routinely monitored for viruses in addition to fecal coliforms, fecal streptococci, total staphylococci, Pseudomonas aeruginosa, Campylobacter jejuni and Legionella bacteria. Wherever possible the source of the organisms will be determined. Swimmers and non-swimmers will be surveyed at each beach, with a telephone follow-up, to determine if illness occurred. This information will be analyzed by computer to determine the relationship between recreational water quality and swimming-associated illness.

PROJECT TITLE: #91 RR CHEMICAL IDENTIFICATION AND BIOLOGICAL ASSAY STUDIES OF ENVIRONMENTAL MUTAGENS, PROMOTERS AND INHIBITORS	IN-HOUSE
	EXTERNAL
	GRANT
	CONTRACT
	UNSOLICITED

(1) OBJECTIVE/S: (See previous Form 02)

1. To utilize newly developed bio-assay systems to determine the mutagenic activity and carcinogenic potential of toxic environmental pollutants.
2. To separate and identify quantitatively the PAH and other potentially mutagenic and carcinogenic organic compounds from the polluted water environment.
3. To determine which chemicals or combinations of chemicals are responsible for mutagenic activity.
4. To determine which substances can act as promoters and which substances can act as inhibitors of mutagenic or carcinogenic chemicals.
5. To investigate the effect of mutagenic chemicals on plants grown in greenhouses and on fish living in fish tanks.

(2) DESCRIPTION: (See previous Form 02)

It is planned to utilize newly developed, rapid, accurate and economical *in vivo* bio-assay systems to determine the mutagenic and carcinogenic potential of various combinations of chemicals found in the air and water environments. It is also planned to investigate substances that act as promoters and other chemicals that can effectively inhibit the mutagenic potency of various chemical mixtures. Mice and fish will be used as test animals. The tier testing strategy will include a spectrum of genetic toxicity tests including bacterial mutagenicity, *in vivo* and/or *in vitro* sister chromated exchange, *in vivo* chromosomal aberrations (micronuclei) and *in vivo* sperm head abnormalities.

PROJECT TITLE: #92 RR

AQUATIC TOXICITY STUDIES OF MULTIPLE ORGANIC COMPOUNDS

IN-HOUSE
EXTERNAL
GRANT
CONTRACT
UNSOLICITED

OBJECTIVE/S:

To determine the effective biological concentrations of selected organics commonly discharged in industrial wastes.

The effects of individual industrially related organic compounds on fish reproduction as well as rates of accumulation and depuration of those organics will be determined. Mixtures of the individual organics will also be tested to determine their joint toxicity effects on the same biological parameters.

DESCRIPTION:

Results of data generated from past organic contaminants studies in the St. Clair, Detroit, Niagara and St. Lawrence River systems will be reviewed by a joint M.O.E. and Environment Canada panel, e.g. (the Proposal 137 Steering Committee), and biologically active compounds identified in the field will be selected for study.

Exposure of flagfish to these selected organics will identify concentrations that impair or inhibit egg production, hatching success, fry survival and growth. Bio-concentration factors due to uptake from water will also be determined. Rates of uptake through food will be determined in rainbow trout to establish food chain effec

Once individual organic effects are established, mixtures of those organics represent tive of concentrations found in river systems will be tested to determine synergistic additive or antagonistic effects on reproduction and bio-accumulation.

Analytical support will be provided by the dedicated GC instrumentation provided by the previous Lottery funded Dielectric Study.

PROJECT TITLE: #94 RR

"WATER QUALITY ANALYSIS OF TROUT FARM EFFLUENT."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	X

(1) OBJECTIVE/S:

1) Determine water quality of several trout farm effluents.
2) Correlate effluent quality to operating practices such as culture systems, feeding systems, etc.
3) Determine the effect of decreasing dietary phosphorous on growth and physiology of rainbow trout.
4) Determine the effect of decreasing dietary phosphorous on wastewater quality.

(2) DESCRIPTION:

This study will monitor wastewaters from several aquaculture operations and relate variations in quality to operational procedures at each site. A second component of the study will include an assessment of fish responses to decreased levels of dietary phosphorous.

PROJECT TITLE: #96 PL "DEVELOPMENT OF A 'NON GC/MS' ORIENTED PROTOCOL FOR ROUTINE ANALYSIS OF ORGANIC TRACE CONTAMINANTS IN MUNICIPAL WASTEWATER TREATMENT PLANT RAW SEWAGES AND FINAL EFFLUENTS."	IN-HOUSE	
	EXTERNAL	X
	GRANT	
	CONTRACT	X
	UNSOLICITED	

(1) OBJECTIVE/S:

1. To develop a "Non GC/MS" oriented protocol for routine analysis in previously characterized and uncharacterized sewage samples.

2. To document and transfer the protocol to the MOE staff in Laboratory Services & Applied Research Branch.

(2) DESCRIPTION:

Present analytical procedures are unsuitable by virtue of cost and time for the routine examination of wastewater samples. The needed procedure must be able to analyze for the presence of HOC's in previously uncharacterized samples. Also, be able to trace the fate of selected HOC's during treatment and support in the future a Certificate of Approval compliance program and allow easy analysis of effluent samples.

PROJECT TITLE: #98 PL "ORGANIC CONTAMINANTS IN THE ATMOSPHERE, EFFECTS OF ADSORPTION TUBE STORAGE AND SAMPLE HANDLING TECHNIQUES ON MEASURED VALUES."	IN-HOUSE	
	EXTERNAL	X
	GRANT	
	CONTRACT	X
	UNSOLICITED	

(1) OBJECTIVE/S:

To determine the optimum storage and handling conditions for Carbosieve-Florsil combination and Tenax-Silicate combination cartridges which have been loaded with a mixture of contaminants normally found in atmospheric sampling.

(2) DESCRIPTION:

Cartridges will be prepared, charged with various mixtures of preselected contaminants by MOE. They will be sealed and delivered to contractor for storage and handling experiments. These will involve the following variables: adsorbent combinations, temperature during storage, interval between sampling and analysis.

PROJECT TITLE: #99 PL "TRACE ORGANIC CONTAMINANT REMOVAL FROM DRINKING WATER."	IN-HOUSE	
	EXTERNAL	
	GRANT	
	CONTRACT	
	UNSOLICITED	

(1) OBJECTIVE/S:

1) To assess the effectiveness of optimized conventional drinking water treatment for the removal of trace organic contaminants.
2) To assess the effectiveness of activated carbon adsorption removals of trace organic contaminants when used in add-on contractor mode.
3) To determine process operational parameters.

(2) DESCRIPTION:

Selected consultants will be invited to submit proposals which address the problem of trace contaminant removal from drinking water supplies as per the Terms of Reference outlined in the RFI. The study will be phased over 24 months covering 3 fiscal years and will include development of analytical and sampling protocol, examination of contaminant removal with conventional treatment processes and development of new treatment possibilities for drinking water supplies.

TITLE: "THE DISPERSAL OF AIRBORNE PARTICULATES ON A SHORT AND LONG-TERM SCALE." #100 RR

OBJECTIVES: In our previous investigations, it has been determined that at least some types of trees are showing increased levels of sulphur and metals, such as copper and zinc, downwind from the smelters in Sudbury. It is planned to continue this study with respect to other species of trees and also to determine the intensity and distribution of pollution downwind.

Our studies have shown that the air particulate streak sampler is capable of determining many elements with a time resolution of about an hour and even some indication of the source of these pollutants. It is planned to increase the number of these samplers in order to pinpoint pollution sources and to follow their dispersal e.g. do they enter buildings?

DESCRIPTION: Proton induced X-ray emission (PIXE) and proton induced gamma ray emission (PIGME) are methods of analyzing the concentration of trace elements in material. Hence much can be learned from the analyses of places where airborne pollutants might naturally collect, as in trees, or be sampled. The content of tree rings depends on the environment where the tree grows so that measuring the concentration of elements in trees can probably be used to determine the distribution of airborne pollutants in space over long periods of time.

With streak air filters, which are placed in strategic locations, e.g. near roads, in buildings, etc., similar analyses means the source of a pollution and its destination can be determined.

Project Title: Retrospective Correlation Spectroscopy and its application to atmospheric monitoring #101 RR

IN-HOUSE	
EXTERNAL	\
GRANT	\
CONTRACT	
UNSOLICITED	\

(1)

OBJECTIVES:

To enhance the capabilities of conventional analogue correlation spectroscopy by developing retrospective digital correlation methods which allow observational atmospheric spectral data to be treated to reveal column densities of numerous molecular pollutants.

(2)

DESCRIPTION:

A general study of the method of digital retrospective correlation spectroscopy was recently completed by the applicant with the support of an NSERC PRAI grant.

This application is to configure the previous work to the specific needs of air quality monitoring in Ontario

PROJECT TITLE: #102 PL

'Studies of Methodology and Instrumental Capabilities for Optimum and Rapid Analysis of PCDD and PCDF Compounds in Water'

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	X

(1) OBJECTIVE/S:

OBJECTIVES: (1) Develop rapid methods to determine PCDD and PCDF in water
(2) Optimize analysis of PCDD and PCDF in municipal incinerator samples.
(3) Comparative evaluation of GC/MS instruments - Waterloo and MDL laboratories.

(2)

DESCRIPTION: XAD resin extraction of PCDD/PCDF from water, clean-up and GC/MS analysis. Optimize extraction methods for fly-ash. Compare methodology results on different instrumental systems.

PROJECT TITLE: #103 PL

"MUTAGENICITY TESTING OF LEACHATES FROM WASTE DISPOSAL SITES."

IN-HOUSE	
EXTERNAL	X
GRANT	
CONTRACT	X
UNSOLICITED	X

OBJECTIVE/S:

To develop methods based on the Ames Salmonella Mutagenicity Assay to detect potentially harmful contamination of groundwater supplies by genotoxic substances leached from landfill sites.

DESCRIPTION:

Select chemical compounds (suspected/known mutagens) exhibiting different functional group features and representing a wide range of polarity in order to develop and validate methods for the collection of organic extract concentrates from both groundwater and site matrix materials. The extracts must be suitable for use in the Ames bioassay. The collection method must be capable of providing sufficient amounts of extract for both initial screening in the Ames assay and any follow-up testing in other bioassay systems. Demonstrate the application of the methodology for the collection of organic concentrates of groundwater and site matrix materials from a representative area within a selected landfill site. The various extracts will be evaluated for mutagenic activity. By comparison of the mutagenicity found in the matrix extracts, it may be possible to develop an index of leachability for mutagenic material that can be related to the mutagenicity found in the associated groundwater.

PROJECT TITLE: #104 PL

"ASSESSING THE IMPACT OF HAZARDOUS LIQUIDS SPILLED ONTO SOIL."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	X

OBJECTIVE/S:

Development of methodology for predicting contaminant dispersal and attenuation arising from spills of hazardous liquids onto soil and the environmental fate of these chemicals. Attention will centre on immiscible liquids including both sinkers and floaters.

DESCRIPTION:

Hazardous immiscible liquids will be studied in terms of:

1. Penetration rates in unsaturated soils,
2. Behavior upon reaching the saturated groundwater,
3. Retention in soil and subsequent desorption,
4. Vapourization rates from a pond and from within the soil.

PROJECT TITLE: #106 RR

"DETERMINATION OF VOLATILIZATION RATES OF ORGANIC CHEMICALS OF PUBLIC HEALTH CONCERN."

IN-HOUSE	
EXTERNAL	X
GRANT	
CONTRACT	X
UNSOLICITED	X

OBJECTIVE/S:

- To develop volatilization rates of organic compounds of public health concern in provincial streams and rivers.
- To develop relationships between volatilization rates and bulk flow characteristics of river channels.
- To summarize relationships between chemical structure and volatilization for compounds of concern to the province.

DESCRIPTION:

Data for the Grand River, Speed River, Canagagique Creek, Nith River, Badon Creek and Avon River will be analyzed. Relationships between channel hydraulics/volatilization/ chemical structure will be investigated.

PROJECT TITLE: #107 RR

"GAS PHASE PHOTOCHEMISTRY OF POLYCHLORINATED BIPHENYLS."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

The proposed research is a preliminary study to assess the photochemistry of individual PCB compounds in the gas phase in nitrogen and air. Homogeneous gaseous mixtures are to be used. The initial study will focus on the identification of reaction products, and it is hoped that the main features of reaction mechanisms can be described. Quantitative mechanistic information such as quantum yields and excited state properties and lifetimes will be deferred to a later phase of the study.

DESCRIPTION:

Polychlorinated biphenyls (PCB's) are ubiquitous pollutants which are transported through the atmosphere over long distances. Relatively little is known of their gas phase photochemistry. The present proposal is for one year of research into the photochemical behaviour of these compounds. This is relevant to whether sunlight can decompose them in the atmosphere. In this proposed study, the primary emphasis will be on product identification when a range of PCB compounds is illuminated individually in air. Gas chromatography and gas chromatography-mass spectrometry will be the analytical methods used.

PROJECT TITLE: #108 RR

"CONTAMINANT MOBILIZATION AND UPTAKE FROM MINE TAILINGS AT COBALT, ONTARIO."

IN-HOUSE	
EXTERNAL	
GRANT	
CONTRACT	X
UNSOLICITED	X

OBJECTIVE/S:

To determine the mobility and bioavailability of contaminants, primarily heavy metals, in mine tailings under varying moisture and chemical regimes.

DESCRIPTION:

Field monitoring of tailings in Cobalt under varying hydrological, chemical, and biological conditions will be undertaken to characterize the types, concentrations, and fluxes of heavy metals with particular attention to the experimental artificial marsh system.

Laboratory experiments will be used to ascertain the leachability of soil contaminants under varying chemical conditions and the bioavailability of contaminants in sampled waters.

PROJECT TITLE: #109 RR "EFFECTS OF METALS FROM MINE TAILINGS ON THE MICROFLORA OF A MARSH TREATMENT SYSTEM."	IN-HOUSE	
	EXTERNAL	X
	GRANT	X
	CONTRACT	
	UNSOLICITED	X

OBJECTIVE/S:

- To assess the effect of metals on the normal microflora of a marsh treatment system.
- To determine if the pH of the effluent has an effect on toxicity.
- To compare metal susceptibility of heterotrophic bacteria from mine tailings and normal marsh systems.

DESCRIPTION:

The potential toxic effects of metals on the microflora of a marsh system at Cobalt will be determined. Laboratory test will include the effects of toxic metals both individually and in combinations at various pH. Quantitative toxicity assessment will be performed.

PROJECT TITLE: #110 RR "MODIFICATIONS TO CHEMILUMINESCENT INSTRUMENTS OF NO AND NO_2 FROM AN AIRCRAFT AND A MOBILE LABORATORY."	IN-HOUSE	
	EXTERNAL	X
	GRANT	X
	CONTRACT	
	UNSOLICITED	X

OBJECTIVE/S:

To modify existing chemiluminescent nitrogen oxide detectors for use to measure NO and NO_2 in tropospheric air from aircraft and from a mobile laboratory.

DESCRIPTION:

The modified instrument will be used by the Ministry for testing urban plume and for transporting models at high sensitivity. The developed technology will be transferred to MOE by converting one of its instruments for such measurements.

PROJECT TITLE: #111 RR

"Ottawa River Nuclear Spill Contingency Model Development"

IN-HOUSE	
EXTERNAL	X
GRANT	
CONTRACT	X
UNSOLICITED	

OBJECTIVE/S:

1. To carry out model programming and documentation
2. To carry out field study planning tasks

DESCRIPTION:

- To test the now developed dispersion model on the Ottawa River and provide computer code to Water Resources Branch.
- To assist in development of field study plan for calibration of the model.
- To develop detailed field plan based on logistics, river channel characteristics and other considerations assessed by means of the program 2-d model.

PROJECT TITLE: #112 RR

"COMPARISON OF THE AMES TEST AND THE REPLICATIVE KILLING ASSAY AS DETECTORS OF MUTAGENICITY IN CHEMICAL COMPOUNDS AND ENVIRONMENTAL SAMPLES."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	X

OBJECTIVE/S:

- To evaluate the Replicative Killing Assay as an adjunct to the Ames test for mutagenic activity.
- To compare the specificities and sensitivities of both assays on mutagenic standard compounds and concentrated water samples.

DESCRIPTION:

Preliminary tests in the Ministry have shown a potential use of this test to detect mutagenic activities. Fifteen model compounds will be evaluated parallel to Ames testing, and the sensitivity will be established.

The results will be transferred for use at the MOE Laboratory.

PROJECT TITLE: #113 PL		
"DIFFERENTIATION OF FECAL COLIFORMS AND FECAL STREPROCOCCI AND VERIFICATION OF NEWER TESTS TO DETERMINE HUMAN AND NON-HUMAN FECES."	IN-HOUSE	
	EXTERNAL	X
	GRANT	X
	CONTRACT	
	UNSOLICITED	X

OBJECTIVE/S:

- To develop microbiological methods for E. Coli and Enterococci for specific identification of fecal pollution.
- To validate the new methods and interrelate them to present methods used for the identification of human and non-human pollution.

DESCRIPTION:

The Ministry will provide analysis of samples collected from different sources for a number of microbiological parameters. The developed and validated methods will be used to improve MOE capabilities for testing of effluents, waters, and sewages.

PROJECT TITLE: #114 PL		
"Effects of exposure to lead, cadmium, and mercury on the tissues of young fish and rats."	IN-HOUSE	
	EXTERNAL	
	GRANT	
	CONTRACT	
	UNSOLICITED	

OBJECTIVE/S:

To study the biochemical effects and enzyme reactions of young fish and rats exposed to toxic metals.

DESCRIPTION:

Fish and rats exposed to mercury, lead, and cadmium will be tested with respect to functional activities, quality and quantity of gene expression.

The results will allow the development of a bioassay for heavy metal poisoning of vertebrates based on biochemical functions.

PROJECT TITLE: #115 PL

"SURVEY OF BLOOD LEAD LEVELS IN SCHOOL CHILDREN."

IN-HOUSE	
EXTERNAL	X
GRANT	
CONTRACT	X
UNSOLICITED	

OBJECTIVE/S:

To determine blood lead levels of Ontario school children.

DESCRIPTION:

Studies of blood lead levels in Ontario children (the group at greatest risk) have been carried out primarily in Toronto. It is proposed to measure blood lead levels of school children in other Ontario communities with known above average ambient air lead concentrations.

PROJECT TITLE: #117 PL

To investigate the "short-term test" mutagenicity and chemical composition of benzene extractable fraction of coke oven emissions.

IN-HOUSE	
EXTERNAL	X
GRANT	
CONTRACT	X
UNSOLICITED	

OBJECTIVE/S:

To establish a scientific base for setting standards or guidelines of PAH in air.

DESCRIPTION:

Study coke oven emissions, compare benzene and possibly other solvent extractable fraction, mutagenicity test results and chemical analysis of air particulates. Potential correlation between short-term mutagenicity test results, benzene extractable fractions, and human health effect from coke oven emission will be investigated.

PROJECT TITLE: #118 PL

"OCCURRENCE AND MOBILITY OF HAZARDOUS ORGANIC CHEMICALS IN GROUNDWATER AT ONTARIO LANDFILLS."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	X

OBJECTIVE/S:

To study and determine the nature, concentrations and mobility of hazardous organic compounds that occur in groundwater at representative municipal landfills in Ontario.

DESCRIPTION:

The study will consist primarily of field investigations that will take place at 7 landfills in a variety of hydrogeologic settings in Ontario. Four of these landfills have been studied as part of our previous Lottery Fund project, which focused on inorganic contaminants. These landfills already have good groundwater monitoring networks. Monitoring networks will be installed at the 3 additional landfills. The landfills represent various ages and are situated in different geologic and hydrologic settings Sampling of the groundwater monitoring networks will provide information on the spatial and temporal distributions of organic contaminants. These distributions will be related to various factors such as landfill age, type of waste, hydrogeological conditions, and contaminant mobility and attenuation.

PROJECT TITLE: #119 PL

"ANALYSIS OF DATA FROM THE STUDY, 'RESPIRATORY HEALTH OF SCHOOL CHILDREN IN HAMILTON.'"

IN-HOUSE	
EXTERNAL	
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

The subject research project produced a tremendous amount of data which was only partially used in the original study. The present funding is to ensure that the data is fully utilized and to provide a small amount of additional data to complete some identified gaps.

DESCRIPTION:

The Ministry of Health is providing funding to continue the evaluation of the children.

MOE needs to reanalyze some of the air particulate data to better relate air quality to lung function. There are some identified shortages in the SO_2 data, and further and better monitoring of this facit is needed.

PROJECT TITLE: #120 PL

"REPORT ON THE STATUS OF GREAT LAKES DRINKING WATER."

IN-HOUSE	
EXTERNAL	X
GRANT	
CONTRACT	X
UNSOLICITED	

OBJECTIVE/S:

To have a report produced and reviewed by impeccable sources completely beyond the realm of Federal and Provincial Governments on the quality of Great Lakes Drinking Water and its potential human health effects.

DESCRIPTION:

1. Collect Canadian and United States data on levels of contaminants in Great Lakes drinking water.
2. Interpret and evaluate the quality of the data.
3. Assess impact of inplace water treatment technologies.
4. Compare to proposed or existing water quality objectives.
5. Evaluate human health implications.

PROJECT TITLE: #121 PL

"OZONE TREATMENT OF DRINKING WATER."

IN-HOUSE	
EXTERNAL	
GRANT	X
CONTRACT	X
UNSOLICITED	

OBJECTIVE/S:

Assessment of the state-of-the-art use of ozone in drinking water treatment.

DESCRIPTION:

This study will address, in detail, gaps in ozone technology use in drinking water which will enable a more informed assessment of future research directions for MOE. Ozone research, particularly with respect to reaction products and their human health effects, can thus relate more effectively to ongoing international efforts.

PROJECT TITLE: #122 RR

"AQUEOUS PHASE LIQUID EXTRACTION TECHNIQUE FOR EXTRACTION AND CONCENTRATION OF TRACE ORGANICS."

IN-HOUSE	
EXTERNAL	X
GRANT	
CONTRACT	X
UNSOLICITED	

OBJECTIVE/S:

To evaluate a new technique to extract and concentrate Trace Organics from large volume Water Samples.

DESCRIPTION:

The Federal Laboratories at Burlington have developed a new technique for the extraction and concentration of Trace Organic compounds such as found in drinking water. Evaluation of its applicability for our use either in the laboratory or in the field for the reduction of large volume samples for GC/MS Analysis and Monitoring.

PROJECT TITLE: #123 PL

"Field and Laboratory Validation of a HiVol Denuder for Minimizing PAH-Oxidant Reactions During Sampling."

IN-HOUSE	
EXTERNAL	X
GRANT	
CONTRACT	
UNSOLICITED	X

OBJECTIVE/S:

1. Evaluate the HiVol Denuder in terms of mass and PAH attenuation, effectiveness for removal of NO_2.
2. Quantitation and identification of the oxy- and nitro-PAH in extract of denuder filter vs. standard HiVol filter.

DESCRIPTION:

Earlier work has determined that a denuder is effective in reducing ozone in air supply to HiVol filter and in lab conditions allows proper sampling for PAHs. Field trials under hot and cold weather conditions required and also to test for NO_2 removal by this sampling system.

PROJECT TITLE: #125 RR

"GROWTH-LIPID DEPOSITION RELATIONSHIPS IN JUVENILE CYRPINIDS AND YELLOW PERCH."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

1. Review literature on growth-lipid deposition relationships.
2. To document interrelationships re climate, food, environmental factors on growth-lipid deposition.

DESCRIPTION:

Determine whether climatic changes and food supply significantly alter growth rates and lipid stores in the fish and therefore alter contaminant accumulations.

PROJECT TITLE: #126 RR

"LEACHING STUDIES OF PCDD AND PCDF FROM MUNICIPAL INCINERATOR FLY ASH."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

1. Determine leaching of PCDD and PCDF from fly ash at various pH (in laboratory).
2. Determine reproducibility of results.

DESCRIPTION:

Fly ash is known to contain PCDDs and PCDFs and is disposed of in landfills. Project is to determine, by laboratory study, the potential availability of the contaminant. This information is needed in classification of the waste fly ash.

PROJECT TITLE: #127 RR

"ANALYSIS OF WATER TREATMENT PLANT CHEMICALS FOR CONTAMINANTS."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To develop analytical methods and define analytical protocols.

DESCRIPTION:

Water plant chemicals such as alum, fluoridation chemicals, polyelectrolytes, chlorine, etc. may contain contaminants of potential human health concern. These are difficult to determine and special methods and protocols are required in order that plants may have their supplies checked.

PROJECT TITLE: #128 RR

"MARSHLAND (LISTOWEL) PROJECT."

IN-HOUSE	
EXTERNAL	
GRANT	
CONTRACT	
UNSOLICITED	

(1) OBJECTIVE/S:

The Listowel artificial marshland facility was established to:

a) determine the capacity of artificial marshes to renovate wastewater, and
b) develop precise guidelines for the design and operation of marshland wastewater treatment systems.

(2) DESCRIPTION:

The present proposal represents a request for continued funding support for "on site" Town of Listowel staff for daily maintenance and monitoring purposes. Previous funding support for this purpose was provided as a part of the Listowel Artificial Marsh Project (No. 18) for a 3 year period. The need for continued research effort requires extension of funding support for 2 additional years.

PROJECT TITLE: #129 RR

"CONDITIONS FOR CONDENSATION AND DESORPTION OF PCDDs AND PCDFs ON PARTICULATE MATTER UNDER STACK SAMPLING CONDITIONS."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

1. To determine desorption of PCDD and PCDF from fly ash into air and condensation on a florisil adsorbent.
2. To make similar determinations using XAD adsorbents.

   Condensation and adsorption results can then be used to correct results of stack analysis samples.

DESCRIPTION:

Analyze fly ash for PCDD and PCDF, place on filter, run controlled air through under various temperatures, and collect on florisil. Run similar experiments with XAD-2 polymeric resin. Use data to correct existing analytical procedures.

PROJECT TITLE: #130 RR

"USE OF INDUSTRIAL LIQUID WASTES AS DUST SUPPRESSANTS ON ROADS."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

1. Review of available literature.
2. Survey of liquid industrial wastes being used, including sources, quantities and primary contaminants.
3. Assess impact of the contaminants found in the above liquid wastes.

DESCRIPTION:

Project information needed by Solid Waste Research Working Group as part of information needed to develop criteria for proposed dust suppression guidelines.

PROJECT TITLE: #131 RR

"DEVELOPMENT OF DESIGN CRITERIA FOR OPTIMAL RECOVERY OF LEACHATE UNDER SANITARY LANDFILLS."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

1. Literature review and compilation of papers on subject.
2. Develop computer model to predict groundwater flow in landfills.
3. Exercise the model to predict the effectiveness of leachate capture for various tile capture systems.

DESCRIPTION:

In order to deal with the many factors affecting leachate flow, surface water infiltration, groundwater flow, types of media and tile configuration, a model is required. This preliminary phase of the study will use a simple case of a refuse-filled ditch to assess the factors to be included and make some preliminary predictions.

PROJECT TITLE: #133 RR

"MACRORETICULAR RESINS AS PRECONCENTRATORS FOR ORGANIC COMPOUNDS."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To provide laboratory testing and results to extend the range of compounds for which resin preconcentration is useful.

DESCRIPTION:

Resin absorbers are used successfully to preconcentrate such organic compounds as PCBs, organo-chlorine compounds. Other organics are susceptible to this technique and project will provide this vital information to Laboratory.

PROJECT TITLE: #134 RR

"DEVELOPMENT OF AUTOMATED TECHNIQUES FOR READING GEL PLATES."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

1. To speed up method of reading gel plates associated with gene typing procedure.
2. To develop reading procedure that can provide data in computer compatible form.

DESCRIPTION:

A densitometer designed to read agarose gel plates used in gel electrophoreces of DNA will be purchased and used in conjunction with current visual methods. If operational, will proceed to connect to computer.

PROJECT TITLE: #135 RR

"USE OF A SPECIAL PROTEIN ADSORBENT FOR THE SELECTIVE ACCUMULATION OF TRACE CONTAMINANTS."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To determine if particular body proteins such as AFP can be used as a method of concentrating traces of organic contaminants for analysis.

DESCRIPTION:

AFP is known to bind polyunsaturated fats in humans. Similar compounds circulate in the blood stream of the fetus. DES is known to bind to and accumulate on AFP. It is proposed to apply the technique to laboratory concentration of trace organics.

PROJECT TITLE: #137 RR

"BIOLOGICAL PHOSPHORUS REMOVAL."

IN-HOUSE	
EXTERNAL	X
GRANT	
CONTRACT	X
UNSOLICITED	

OBJECTIVE/S:

To investigate the feasibility of implementing Bardenpho biological phosphorus removal at Great Lakes sewage treatment plants based on information gained in the operation of a full-scale biological phosphorus removal plant funded by Environment Canada at Kelowna, B.C.

DESCRIPTION:

The possibility of retrofitting the Bardenpho process to several activated sludge process configurations used in Ontario plants will be investigated, and detailed estimates for hardware modifications and annual operating costs developed. These will be compared to existing operating costs for the activated sludge plants providing integrated chemical precipitation for phosphorus removal.

Participants:

Federal Funding:	The Eutrophication Issues Group of the Great Lakes	$35,000
	EPS - Environment Canada	$20,000
	FEDERAL TOTAL	$55,000
Ontario Funding:	Ministry of the Environment	$20,000
	ONTARIO TOTAL	$20,000

PROJECT TITLE: #138 RR

"INTEGRATED PEST MANAGEMENT ON FIELD CORN: A FEASIBILITY STUDY."

IN-HOUSE	X
EXTERNAL	X
GRANT	
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

1) to define the scope of the problem through a one year survey of the pest complex (insects and weeds) in field corn;
2) to evaluate available monitoring techniques with emphasis on combining various methods into a total program suitable for Integrated Pest Management;
3) to demonstrate the capability of making cost-effective Integrated Pest Management decisions for field corn.

DESCRIPTION:

Approximately 1/2 of the 0.8M hectares of field corn grown annually in Ontario are treated with insecticides for rootworm control. Previous studies have shown that this extent of pesticide usage is unwarranted, but a suitable data base for evolving an Integrated Pest Management approach is unavailable. The present study would therefore monitor some 20 field sites for both weeds and insects. Monitoring techniques presently recommended for each pest would be evaluated. Research inputs from Agriculture Canada and the University of Guelph, combined with the survey data, would then be used to evaluate the effectiveness and reliability of an IPM program for field corn.

PROJECT TITLE: #142 PL

Experimentally determined mutation rates in lung and Bronchial epithelia as a primary air pollution standard.

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

Development of a mutagenic test for atmospheric contaminants using cells derived from the lining of the lung and the bronchus.

DESCRIPTION:

1. Isolate viable cells from the lining of the lung and bronchus.
2. Develop a suitable culture media for the growth of the isolated cells.
3. Develop suitable techniques for rapid examination of large numbers of cells.

PROJECT TITLE: #143 PL

"A critical comparison of ICP-Mass Spectrometry Instrumental Neutron Activation analysis and Flameless AAS for the analysis of rain, snow and water samples."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To develop and verify new multi-element analytical methods using the advanced Inductively Coupled Plasma-Mass Spectrometry technique and compare them to the established Neutron Activation and Atomic Adsorption techniques. Rain, snow, and surface water will be used as test samples.

DESCRIPTION:

Standard reference materials will be used during the development and verification stages of analytical methods.

The developed protocol will be available for use by MOE which is also acquiring a similar advanced multi-element analytical system.

PROJECT TITLE: #144 PL

To determine Dose-Response Relationships for Food Crops due to the Effects of Airborne Gaseous and Particulate Pollutants

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

1. Determine response of tomatoes, potatoes and cabbages to ozone and particulates with nickel.
2. Determine pathway of contamination of potatoes, tomatoes, and cabbages.
3. Dose-response relationships for visible injury and growth rates under long-term exposure at ambient levels in polluted regions.
4. Provide objective data on relationships of pollutant concentrations to plant growth and yield and indicate acceptable levels to protect food crops from damage.

DESCRIPTION:

Controlled exposure experiments are to be conducted at the University of Guelph using ozone and nickel application to tomatoes, potatoes and cabbages. Visible injury, growth and yield effects will be evaluated. Statistical and experimental procedures leading to development of response curves and surfaces will be used to graphically portray plant responses. Tissue analysis will reveal the distribution of nickel and its pathway to edible fruit and tubers. Dose-response relationships will be expressed by equations. Direct comparisons will be made with monitored levels of pollutants in contaminated regions and emphasis will be placed on the utilization of 7-hour per day regimes in ozone studies.

PROJECT TITLE: #145 PL

"The distribution, origins, and behaviour of local shallow groundwaters containing elevated concentrations of chlorides."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

1. To determine natural background levels of groundwater contaminants and identify their sources.

2. To determine chemical behaviour of groundwater contaminants, their migration and accumulation rates, and evaluate regional magnitude of the problem.

DESCRIPTION:

1. Literature and land use data will be reviewed, and sampling and analyses of groundwater for background data and site selection will be developed.

2. Contaminated groundwater will be analyzed to identify contaminant migration and accumulation.

Completion of this project will provide MOE with a protocol to identify point and non-point contamination sources and with the capability to predict long-term hazard from non-point sources of contamination.

PROJECT TITLE: #146 PL

"Synthesis of chlorinated Azobenzenes"

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To synthesize chlorinated azobenzenes of high purity for use as analytical standards in MOE laboratory.

DESCRIPTION:

Seven chlorinated azobenzene compounds will be prepared, purified and tested and supplied in sufficient quantities for MOE use.

The validity and capability of analyses in MOE laboratory depends on the quality and availability of high purity chemicals.

PROJECT TITLE: #147 PL

Geochemical investigation of the Origin and Properties of Near Surface Fractures in Clay Till.
(for potential application in siting of landfills in clay)

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

1. To determine the distribution and properties of fractures in clayey glacial deposits.
2. To define possible processes by which fractures in clayey deposits were created.
3. To assess the geomechanical effects of clayey till fractures on the flow of leachate through the weathered zone.

DESCRIPTION:

It is proposed to investigate the geomechanical behaviour of fractured clayey till in an attempt to probe the origin of these fractured zones. The potential of these fracture networks to allow contaminant migration is of concern to environmental agencies. Studies dealing with the changes in hydrogeologic characteristics under various stress and hydraulic pressure conditions are essential to better evaluate the suitability of these deposits for waste disposal.

PROJECT TITLE: #148 PL

"Development and validation of protocols for sampling surface and groundwaters for volatile organic contaminants"

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To evaluate water sampling techniques presently used for volatile organic contaminants and develop improved methods and validate them.

DESCRIPTION:

A group of volatile organic compounds will be selected to test present ground and surface water sampling techniques. New methods will be developed to alleviate losses due to volatilization and other possible sampling bias using sorption resins.

The project will provide the Ministry with reliable means of sampling natural water. This is especially important for sampling groundwater near landfills.

PROJECT TITLE: #149 PL

"The fate of hazardous organic compounds in municipal water pollution control plants"

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To develop a model and protocol for the prediction of fate of hazardous organic compounds in municipal water pollution control plants.

DESCRIPTION:

Literature will be reviewed, analytical methods developed for a selection of hazardous chemicals, and a laboratory model simulating a municipal wastewater treatment system will be constructed. The latter will be tested and used to study the fate of hazardous contaminants in control and actual wastewater samples. The refined model will be applied to data obtained from a full-scale plant.

The present study complements several related studies now in progress such as: hazardous contaminants in WPCP in Hamilton, development of a routine protocol for wastewater analyses, etc.

PROJECT TITLE: #150 PL

"Development of predictive organic contaminant structure-property-toxicity relationships for aquatic organisms."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To develop methods to correlate organic contaminant structure to its physical properties, organism uptake rates, and toxic effects.

DESCRIPTION:

The physical properties of a wide selection of organic compounds (30-50) will be correlated to their molecular structures and toxicity levels. The latter will be extended to include bioassays. The findings will be extended to link with MOE toxicity data on both individual and mixtures of hazardous chemicals.

PROJECT TITLE: #151 PL

"Development of sampling and measuring techniques to determine correlation and mobility of volatile hydrocarbons in groundwater and leachates."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To develop a reliable sampling technique that will preserve volatile hydrocarbons in groundwater and leachates using Gloucester Township landfill as test site.

DESCRIPTION:

A sampling protocol will first be developed and tested in the laboratory prior to its use at Gloucester Landfill site. Well water will be sampled and the mobility of selected volatile hydrocarbon compounds will be determined and compared to laboratory data. Contingency and analytical support will be provided by the Natural Hydrology Research Institute Environment Canada. This project will establish a reliable protocol for use by MOE for groundwater sampling and landfill projects.

PROJECT TITLE: #152 PL

"The effects of tile drainage and open ditches on peak flows and dry weather flows."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To assess the effects of tile drainage and open ditches and dry weather flows with particular application to Ontario.

DESCRIPTION:

A simulation model for tile-drained agricultural fields and basins will be developed and evaluated. The developed technique will be used to study tile drained fields in the South Nation River.

The study will provide an improved tile drain design that reduces erosion and produces information necessary for the development of drainage guidelines.

PROJECT TITLE: #153 PL

"Laboratory and Numerical Model Studies to Design Criteria for Optimal Recovery of Leachate under Sanitary Landfills."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

Evaluation of tile drain systems as a method for leachate capture

Development of criteria for design of tile drain systems for leachate capture.

Development of criteria for overall design of landfills to enhance leachate capture.

DESCRIPTION:

To modify a scaled physical model landfill to simulate the effects of tile configuration on leachate capture and migration for different settings including clay liners under varying simple but realistic hydrogeologic and climatic conditions.

To test a numerical model for conditions tested physically and extend model to account for anistropy and simple layered media and use the model to evaluate and predict effectiveness of leachate capture for various tile configurations and hydrogeologic settings.

PROJECT TITLE: #154 PL

"To prepare a specific genetic "probe" from fecal streptococci isolated from geese and use it to determine the impact of goose fecal material on the microbiological quality of the bathing water of Toronto Western beaches."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To determine the impact of geese fecal contaminants on the bathing water of Toronto-Western beaches.

DESCRIPTION:

Genetic probes will be prepared from fecal streptococci isolated from geese waste at Toronto Western beaches and use them to compare with the DNA of streptococci isolated from beach sediments. The results will indicate the impact of goose fecal contamination on the microbiological quality of bathing water.

PROJECT TITLE: #155 PL

"The elimination of solvent effects in IN VIVO mutagenicity assays"

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

The development of a solvent(s) for use in mutagenicity testing which shows low toxicity, suitable solvent capability, and to modify the response of assay system to the mutagens being assessed.

DESCRIPTION:

Several solvent systems will be tested and an optimum solvent will be selected primarily for in vivo mutagenicity assays. The potential for In vitro application will also be tested. This project will result in reduction of inter-laboratory variability in mutagenicity testing and improves credibility of test results.

PROJECT TITLE: #156 PL

To determine the integrity of solidified wastes by Large Scale Leach Columns under Environmental and Controlled Conditions

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To determine the effects of the parameters of time, temperature, leaching solution, PH, weather and biological action on the integrity of solidified wastes in land disposal.

DESCRIPTION:

Relatively large leaching columns (5' x 1' diameter) will be used under natural environmental conditions to follow solid waste degradation products and the extent and rate of leaching. These results will be compared to controlled leaching agents under the same conditions. In addition, short-term leaching tests will be carried out under laboratory conditions to determine the predictive abilities of these tests.

PROJECT TITLE: #157 PL

"The assessment of a point source discharge of suspected mutagenic and carcinogenic contaminants: an epidemiological approach."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To develop methodologies and assess mutagenic and carcinogenic effects on fish.

DESCRIPTION:

Techniques will be developed for sampling and testing adult and young-of-the-year fish exposed to waters contaminated with industrial wastes for genotoxic, mutagenic and carcinogenic damage.

This subject has lately received public and scientists attention.

PROJECT TITLE: #158 PL

Preliminary Evaluation of Plume Tracker in Remote Sensing of Stack Emissions of Sulphur Dioxide

IN-HOUSE	
EXTERNAL	X
GRANT	
CONTRACT	X
UNSOLICITED	

OBJECTIVE/S:

To evaluate modifications to Plume Tracker to obtain reliable measurements of sulphur dioxide stack emissions remotely from the emission source.

DESCRIPTION:

Necessary modifications will be made to a Plume Tracker and the effect of these changes will be evaluated at 2 sources. Initial evaluation experiments will be carried out at either Brampton or Mississauga using a smoke machine available from the MOE Training Section.

PROJECT TITLE: #159 PL

"Aquatic Toxicity Studies of Multiple Organic Compounds"

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To provide toxicological data in support of provincial water quality objectives using a selected number of organic compounds both individually and in mixtures.

DESCRIPTION:

Laboratory fish will be exposed to a pre-selected number of hazardous chemicals and chronic toxicity and bioconcentration data be produced for both individual compounds and their mixtures.

MOE funding of a completed project has assisted in establishing a recognized centre of excellence in fish toxicity at Lakehead and provided the Ministry with information required by Water Resources and Hazardous Contaminants Branches.

PROJECT TITLE: #162 PL

"Development of a methodology for use of freshwater clams as a biological response system to monitor the nearshore environment of the lower Great Lakes."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

1. To select biological response variables related to molluscs in Lake Erie.
2. To identify analytical methods and contaminants, and evaluate the use of bivalve mollusc shells to generate time-profile environmental impact data.
3. To develop statistical models which predict biological response from environmental quality.
4. To assess the developed models and genetic response at several locations.

DESCRIPTION:

The developed models will be used to conduct field studies in the Long Point Bay area to establish the dominant mollusc species and environmental and biological gradients. Genetic response to contaminants will be estimated for various mollusc species.

The study will provide the Ministry with an inexpensive, long-term method for assessing the quality of Great Lakes nearshore environment using molluscs for bio-monitoring.

PROJECT TITLE: #163 PL

"A Study of Water Filtration -Sampling Systems."

IN-HOUSE	
EXTERNAL	X
GRANT	
CONTRACT	X
UNSOLICITED	X

OBJECTIVE/S:

To provide MOE with improved procedures for obtaining water samples for analysis in which it is possible to discriminate between dissolved and particulate associated contaminants. Specifically, the work will involve obtaining performance data for existing filtration systems and attempting to improve the efficiency and performance of systems by novel methods for preconcentration of hazardous contaminants such as dioxins and other halogenated aromatics.

DESCRIPTION:

The Study will include:

1. Literature review and identification of potential filtration systems.
2. Acquisition, installation, and testing of all systems on natural and drinking waters.
3. Compilation of test data and interpretation as volume flowed and flow rate versus pressure drop.
4. Develop methods to improve flow characteristics and make recommendations for use by the Ministry.

The study is of special value to analytical, water quality, and hazardous contaminants programs.

PROJECT TITLE: #164 PL

"The deposition of aerosols on cylinders and filters in turbulent crossflow."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To develop a mathematical model for the deposition of submicron aerosols on non-streamlined surfaces, and apply it for the design of source control equipment and deposition processes.

DESCRIPTION:

A theoretical computer model for aerosol deposition will be developed and used in the simulation of source control equipment such as scrubbers and turbulent flow filters. The system will then be evaluated for emission control.

The findings will assist in understanding and predicting deposition rates of aerosols in air scrubber design.

PROJECT TITLE: #165 PL

"The Quantitative Assessment of Toxicity of Ingested and Inhaled Halogenated Aromatic Hydrocarbons (Dioxins, Etc.)

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

1. To study the suppression of immune function and alteration in susceptibility to disease due to exposure of biological systems to dioxin, PCB, PBB, and other halogenated aromatic hydrocarbons with similar mechanisms for toxicity.

2. To develop non-invasive tests which could be used to assess whether or not exposure to these hazardous contaminants has occurred and provide a predictive dose-response relationship that can be used to the effect of such exposures on the immune system.

DESCRIPTION:

Work on the assays of thymus hormone will be commenced and studies of oral as opposed to intrapertionially-administered dioxin will be carried out.

Information obtained on thymus hormone or the frequency of occurrence of T-lymphocyte surface markers will move towards the development of in-vivo tests, time and dose-response for immunosuppression for halogenated aromatic hydrocarbons both individually and in mixtures.
BENEFITS: 1. The ability to test chemically ill-defined mixtures of hazardous contaminants and to determine their potential biological effect.
2. The ability to survey human popuations for exposure to mixed halogenated aromatic hydrocarbons.

PROJECT TITLE: #168 PL

"Pilot testing ozonation and biological activated carbon for Township of Atikokan Water Treatment Plant."

IN-HOUSE	
EXTERNAL	X
GRANT	
CONTRACT	X
UNSOLICITED	X

OBJECTIVE/S:

To carry out a pilot plant study to determine the effectiveness of pre-ozonation in conjunction with either conventional direct water treatment filtration system or using activated carbon filters.

DESCRIPTION:

Effectiveness of ozone treatment of drinking water will be assessed in terms of achieving the required water quality, together with a review of operating and capital costs. Consideration will be given to chemical stabilization using lime and soda-ash for water treatment as well as to the seasonal variation in raw water quality.

The study will provide the Ministry with the design data and possible solution for drinking water treatment in Northern Ontario communities with similar water characteristics.

PROJECT TITLE: #169 PL

"Plant bioassays for the detection of environmental mutagens"

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To develop and demonstrate the value of plant systems as detectors of environmental mutagens, and apply the developed techniques to selected chemicals.

DESCRIPTION:

Previous preliminary mutagenicity studies on two plant systems will be extended and verified using standard mutagenic hazardous substances. The assays will further be applied to a series of 10 suspected and non-mutagenic compounds as designated by MOE.

The project will enable the Ministry to carry out in-situ studies using plants subjected to ambient pollutants.

PROJECT TITLE: #170 PL

"Syntheses of oxygen and sulphur PAHs of interest in environmental pollution and toxicology."

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To prepare polynuclear aromatic hydrocarbon compounds for use as chemical standards in the analysis of air particulate matter.

DESCRIPTION:

A method will be developed for the preparation of PAH furans and related hazardous compounds. The method will be extended to the preparation of thiophenes and other chemicals suspected in emission sources from coal, municipal incineration and diesel engines.

PROJECT TITLE: #171 PL

Chemical and Physical Characterization of Airborne Particulates and their Sources through Multi-Element Analysis and Receptor Modelling.

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To study aerosol matter from man made and natural sources in Ontario.

Elemental concentration data will be used to apply receptor models to urban areas.

The above will provide a basis for the comparison of receptor models and the refinement of those models.

DESCRIPTION:

Air filter sample sets will be collected at various sites in an urban area and near dominant point sources. Samples will be analysed for up to 40 major, minor, and trace elements by proton and thermal activation analysis. The concentration data, in conjunction with particle size distributions and wind direction, will be used to evaluate receptor models and to examine some assumptions of these models.

PROJECT TITLE: #172 PL

Exchange and impact of external air particulates on inside air.

IN-HOUSE	
EXTERNAL	X
GRANT	X
CONTRACT	
UNSOLICITED	

OBJECTIVE/S:

To study the relationship between air particulates inside and outside a building in order to detect the time required for an external pollution episode to penetrate the building and its impact on internal air quality.

DESCRIPTION:

Streak sampling systems suitable for indoor monitoring will be constructed using modifications of the present outdoor model. Air particulates inside and outside the school will be collected during a period in the winter when doors and windows are normally closed. The analysis of these streaks with proton induced X-ray emission (PIXE) will be undertaken and the indoor results will be correlated with those from the outside.

FORM 02

ONTARIO
MINISTRY OF THE ENVIRONMENT

External Research Proposal
Summary Form

This form is to be completed by the applicant for the benefit of the Ministry. It is not a substitute for the detailed submission prepared by the applicant and should accompany that submission. The form should be completed by a contractor, consultant or university investigator submitting a solicited or unsolicited proposal for funding by grant or contract.

The detailed submission for an unsolicited proposal must include a sufficiently extensive report of the background literature to justify the position taken in the request for funding. All submissions should include a detailed cost breakdown by years, statement of experience, list of publications, and curriculum vitae. Provide information on consultants or other experts who would be hired and a full description and objectives of the proposed study.

While grant recipients are encouraged to publish the results of their work until the project has been completed and the final report released, permission must be obtained from the Office of Research prior to the release of any data from the projects.

INFORMATION TO APPLICANTS REQUESTING SUPPORT FOR THEIR PROPOSAL BY MEANS OF A GRANT OR CONTRACT

It is agreed that the information outlined in Revision No. 5 of the publication, "Information Booklet on Grants and Contracts and Instructions for Contract Liaison Officers and Grant Liaison Officers," issued by the Ministry of the Environment, apply to any grants or contracts made pursuant to this application and the conditions described in the booklet are hereby accepted by the applicant and the applicant's employing institution. These conditions are as follows:

CONDITIONS OF AWARD OF GRANT OR CONTRACT

In the event that a grant or contract is awarded, the applicant and his/her institution agree (to) (that):

1. Provide the Research Advisory Committee, Ministry of the Environment, with a written report on the work completed during the fiscal year that the grant was held and with copies of all reports or publications resulting from this project.
2. Provide an audited statement of expenditures at the end of each fiscal year to the Liaison Officer.
3. Provide to the Liaison Officer at the end of each fiscal year a list of capital equipment purchased with grant monies.
4. Return all capital equipment purchased with grant monies at the completion of the project or, alternatively, make some other suitable arrangement in writing with the Research Advisory Committee if the equipment will continue to be used to carry out related work.
5. Immediately notify the Liaison Officer of any change in the scope or nature of the work program, and return all funds to the Ministry not required to carry out the approved, revised program.
6. Return to the Ministry all grant funds remaining at the completion of each Fiscal Year or at the completion of the project.
7. There will be no stipend or salary paid to the Principal Investigator(s) from the grant.
8. The applicant agrees to provide a progress report every six months in addition to a final report which details the entire project and must be approved by the Ministry.
9. No overhead will be paid or accepted in connection with this grant.
10. Allow an Ontario Provincial Government Auditor access to the financial records of the project either during or after its completion.
11. The signatures below indicate that the contractor or grantee is committed to present a paper on the subject of the study at a conference after completion of the project if requested by the Ministry of the Environment.

DEAN, HEAD OR CHAIRMAN: _____
Name Signature Phone Number

PRESIDENT OR PRINCIPAL: _____
Name Signature Phone Number

DIRECTOR OF RESEARCH ADMINISTRATION: _____
Name Signature Phone Number

FINANCIAL ADMINISTRATOR: _____
Name Signature Phone Number

APPLICANT: _____
Name Signature Phone Number

RESEARCH PROPOSAL SUMMARY

PROPOSAL NO. _____ PROJECT NO. _____

PROPOSAL TITLE:

PROPOSAL IDENTIFICATION: This proposal is submitted as:

(a) Solicited (requested by MOE) _____

(b) Unsolicited (not requested by MOE) _____

(c) Funding requested as a contract _____

(d) Funding requested as a grant _____

CONTRACTOR OR GRANTEE:

PRINCIPAL INVESTIGATOR AND AFFILIATION:

SPECIALISTS:

BUDGET:	YEAR #1	YEAR #2	YEAR #3	TOTAL
Salary:				
Travel:				
Supplies:				
Equipment:				
Overhead (Not paid to universities):				
Services:				
Other (specify):				
TOTAL:				
Total No. of Mandays				

CURRENT OR PREVIOUS RESEARCH FUNDING:

Has this proposal or one similar to it been submitted elsewhere for funding?

Yes _____ No _____ If yes, where?

Has it been accepted? Yes _____ No _____ If yes, approved funds: _____

No. of years _____

SUBMITTED BY: _____ DATE: _____

NAME: _____ TITLE: _____

ADDRESS: _____ PHONE NUMBER _____

.../

OBJECTIVES OF THE STUDY:

YEAR 1 OF STUDY

DESCRIPTION:

ANTICIPATED RESULTS:

YEAR 2 OF STUDY

DESCRIPTION:

ANTICIPATED RESULTS:

YEAR 3 OF STUDY

DESCRIPTION:

ANTICIPATED RESULTS:

.../

COMPLETE STUDY

OBJECTIVES:

DESCRIPTION:

ANTICIPATED RESULTS:

POTENTIAL FOR IMPLEMENTATION OF RESULTS:

OUTLINE OF BENEFITS:

POLICY AND PLANNING BRANCH, OFFICE OF RESEARCH FORM 03

PROJECT TITLE:		
	IN-HOUSE	
	EXTERNAL	
	GRANT	
	CONTRACT	
	UNSOLICITED	

OBJECTIVE/S:

DESCRIPTION:

PLEASE COMPLETE ABOVE.